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Vol. XXXIII ST. LOUIS, AUGUST, 1923 No. 8

ORIGINAL COMMUNICATIONS.

(Original Communications are received with the understanding that they are contributed exclusively to THE LARYNGOSCOPE.)

THE SIGNIFICANCE OF PNEUMATIZATION OF THE MIDDLE TURBINATE; WITH HISTIOLOGICAL CONSIDERATIONS.*

DR. HARRY L. BAUM, Denver.

My interest in this subject was first aroused by the comapartive frequency with which air cells are encountered in the middle turbinate, both in clinical work and anatomical studies, and by the fact that these structures are so often spoken of as "cysts" when under discussion. Their presence was recognized by anatomits as far back as Santorini, 1739[1], and Chantreuil, 1869[3], and by clinicians as early as Dupuytren, 1830[2]; Zuckerkandl[4], in the first edition of his book, 1882, makes mention of them and subsequently the subject has been more or less thoroughly treated by various authors as noted in the appended bibliography. They are also mentioned in many text books, but no attempt has been made to include these references in the bibliography except when directly referred to in the paper.

Although not within the province of this paper to recount in detail the variety of theories advanced by different authors on this subject, it is of interest to note briefly the most important. Although Zuckerkandl considered these cells to be congenital anomalies, Glasmacher[5] as early as 1884 recognized that they might be normally situated cells and their subsequent dilitation the result of disease. Heyman[10] six years later advanced the theory that they were aberrant ethmoid cells and others, such as Schmiegelow[11], held to the

*Read before the Mid-Western Section, American Laryngological, Rhinological and Otological Society, Omaha, February 21, 1923.

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opinion that the condition was entirely pathological. MacDonald[14] thought that the cells were formed as a result of an osteophytic periostitis with extension outward and upward of the free border of the turbinate and ultimate contact and union with its body. His theory was seriously entertained by Knight[13], Stieda[21] and others and a similar view was advanced by Hajek[58]. The theory of myxomatous degeneration advanced by Beausoleil[17] was somewhat analagous to that of a rarefying osteitis mentioned by Knight[13] and to the opinion of Woakes[15] who stated that "they seem to be a pathological accident of disease of the turbinate bone."

Most of the early observers recognized that under certain conditions enlargement of these cells occurred, and ascribed it to various causes. Stieda[21] was of the opinion that irritation played an important part in their enlargement while Frankel[9] ascribed it to pressure of contained secretion. Myerson[18] considered that both these influences were factors and Harmer[42], while recognizing that enlargement did occur, denied that irritation and inflammation had anything to do with it. Sundholm[36] contended that enlargement did not occur beyond the limits of the normal but recognized the occurrence of pathological changes within the cells, such as empyema and mucocele.

Reardon[27], in 1898, reviewed many of the theories mentioned above, gave a very good histological description of the condition and concluded that it was due either to an ectasia of the ethmoid or to an aberrant ethmoid cell. Clark[32] also, in 1900, reviewed the various theories then extant and quoted Lothrop[31] as to the anatomical origin of the condition, concluding that "in view of the origin of these growths any evidence of an inflammatory process, such as polypi or purulent contents, is simply adventitious." Shambaugh[40], in 1902, also reviewed the older theories, stated that in his opinion the concha bullosa represented but an enlarged ethmoid cell and concluded that it should be looked upon not as an inflammatory product, but as an anatomical variation, the result of a developmental anomaly.

Turner[38], in 1904, referring also to Lothrop's anatomical research[45], stated that in his own anatomical studies he had found air cells present in 20 per cent of specimens examined and referred to the common variations in the development of the ethmoidal air cells as proof that in a certain number of these cases the condition is not a strictly pathological one. However, he went on to state that in spite of these facts there is abundant proof of the inflammatory nature of the origin of the majority of them.

Skillern[56], in 1910, also reviewed very exhaustively the older theories both as regards origin and enlargement of these cells, gave an excellent description of their histopathology and concluded that they are anomalously situated normal ethmoid cells, that they can enlarge without the pressure of any pathological product, that pathological conditions can contribute toward their enlargement and that the histological changes in the mucous membrane and bone at the base of the "cyst" are due to mechanical irritation. He explained the enlargement of these cells without the presence of pathological products on a theory of congestion resulting in positive and negative disturbances of nutrition.

This brief review and a study of the bibliography will convince the reader that a great variety of opinions have been expressed in the past relative to this subject and paves the way for consideration of the origin and development of these cells.

Fundamentally, it must be recognized that air cells, either single or multiple, are normally present in the middle turbinate in a certain percentage of cases. Turner[38] found them in twenty per cent of his series, Lothrop[45] found them in 89 out of 1000 specimens, or about 9 per cent, Schaeffer[60] found them in approximately 12 per cent of 200 adult specimens and Davis[59] found them in 8 per cent of cases over ten years and 3 per cent under that age. It is also true that they are not exclusively a development of adult life as proven by the observations of Davis just referred to. Schaeffer also reports the finding of a conchal cell in a fetus at full term and Kikuchi[43] mentions having made the same observation in a four months fetus. It is therefore evident that pneumatization of the middle turbinate is not an anomaly but a normal anatomical entity and when we consider that embryologically the middle turbinate develops as an outgrowth from the lateral ethmoid mass, pneumatization of which eventually forms the ethmoid labyrinth, it may occur to us to wonder why air cells are not found even more frequently in the turbinate.

It must be recognized, however, that although normal in themselves these cells sometimes assume proportions which by their mere size cause mechanical obstruction and pressure and are in that sense pathological. It is of course conceivable that enlargement of a conchal cell might be brought about by pressure of contained secretion, as in an ethmoid or frontal mucocele, but in the type of dilitation under consideration the cell contains nothing but air and its lining membrane is normal, as is also its bony wall. We must therefore turn to the question of development for an explanation.

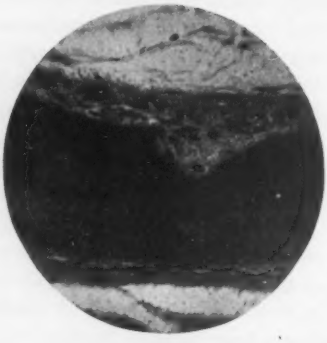
All observers have remarked the great lack of uniformity of pneumatization of the ethmoid mass, resulting in a great variety in size and number of cells, even to the extent of invasion of the frontal sinus and antrum in many instances. Turner[38] also cites two cases reported by Meyjes and Röpke of extreme dilation of the frontal sinus without evident cause and doubtless due to abnormal development alone. If these abnormalities of development can occur in the ethmoid and frontal without cause it is certainly logical to conclude that like developmental anomalies may occur in air spaces of other structures, such as the middle turbinate.

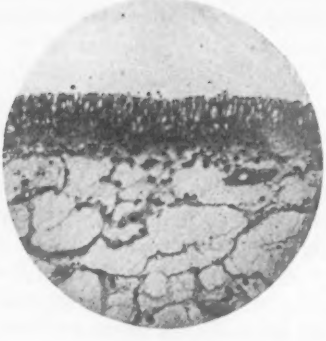
The presence of pus or mucous, or the incidence of other pathological change, occurs in cells of all sizes. Enlargement has nothing to do with infection and subsequent pathological change, with the possible exception that in the enormously dilated type drainage would naturally be more difficult because of the location of the ostium, which anatomical observation has shown to be always at the top. It has also been established that the drainage opening from these cells is sometimes above and sometimes below the middle turbinate so that secondary involvement from a posterior ethmoidal infection in the former case or from an anterior ethmoidal infection in the latter is easy to imagine.

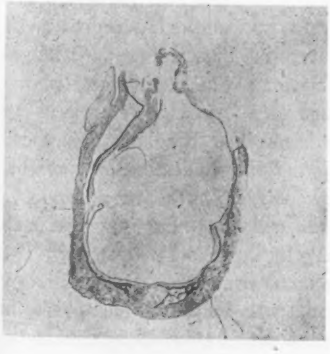
Both Schaeffer[60] and Lothrop[45] illustrate instances wherein an ethmoid cell proper has enlarged into the body of the turbinate or a turbinate cell has enlarged into the body of the ethmoid, in this way bringing these structures into even more intimate relation for common participation in pathologic change.

A brief study of the histology of these structures is now in order.

The Normal Turbinal Cell: A cross section shows a thin bony wall with few areas of rarefaction. An occasional osteoclast is to be seen invading the bone on the interior of the cell and there is a certain amount of osteoblastic activity on the outside of its wall, but there is no evidence of abnormal rate of bone change. It is pertinent to note in this connection that the turbinate is the site of constant change in bone structure resulting in the areas of rarefaction always seen in healthy turbinate bone tissue. These areas of rarefaction are more frequent at the base of the cell but are in no sense pathological. The mucosa lining these cells is composed of a single layer of ciliated columnar epithelium, resting on a supporting layer of cuboidal type and underlying which is a thin sub-epithelial stroma containing practically no mucous glands except near the ostium of the cell where a few may be found in some specimens. This supportive structure is very loose, and is the seat of







slight round cell infiltration among its fibres. Blood vessels are few and small and there are no venous spaces such as are found in the nasal mucosa proper. The outside of the cell presents the same histologic structure found in any middle turbinate, with its covering of stratafied columnar ciliated epithelium, numerous mucous glands in the sub-mucosa and the typical vascular distribution.

The Dilated Turbinal Cell: Surprising as it may seem, cells of this type show exactly the same histology as those of normal size, with the exception of the changes taking place in the mucosa of the outside of the turbinate due to pressure and nasal inflammatory change. The bone of the cell wall is consistently thin but not abnormally so and shows no marked evidence of rarefaction such as might be expected. In fact there is no pathological bone change and no undue evidence of resorption and growth. The picture is in every way that of a normal physiological process. The mucosa lining the cell shows no pathological change whatever and is identical with that described above.

The Infected Turbinal Cell: These cells, whether enlarged or of normal size, may be the seat of pathological change due to infection; in which case the histology is very similar whether the cell is the seat of a pus or a mucous forming process. The bone here has the same histologic appearance as in a normal cell, there being no evidence of osteitis or abnormal rarefaction. The lining membrane of the cell shows distinct evidence of pathological change, the epithelium being lifted from the bone to the extent in some places of almost closing the cavity with its swelling. This condition is due to sub-epithelial edema resulting in a fine, loose, fibrillar structure markedly infiltrated with serum, numerous round cells throughout and some increase in number of blood vessels. There is occasionally to be seen a nest of round cells signifying an old process of inflammation of mild degree. There is no marked overgrowth of fibrous tissue in the sub-epithelial layer, the outstanding pathological change being the edematous infiltration. The epithelium shows slight evidence of pathological change, the cilia being intact and the individual cells showing no pressure effects. Frequent goblet cell formation showing hypersecretion is the only indication of epithelial participation in the pathological process. There are no mucous glands except near the ostium of the cell and these few are small and undeveloped and show no pathological change of note. The tissues of the outside of the turbinate present the usual picture of nasal pressure and inflammation, with epithelial metaplasia in places from the normal stratafied columnar to cuboidal or squamous.

loss of cilia, the formation of fibrous tissue in the sub-epithelial layer, dilitation of gland acini and edamatous infiltration. Vascular changes and increase in round cells are also noticeable.

CONCLUSIONS.

1. Pneumatization of the middle turbinate is a normal anatomical entity.

2. Dilitation of a turbinal cell to a size sufficient to be called pathological is an anomalous development, an over-pneumatization, and is not the result of disease.

3. When the conchal cell contains anything but air it is diseased in the same way that any other accessory cavity may be diseased and has been infected subsequent to its development.

4. These observations are borne out by embryological, anatomical and clinical observations and by the fact that the microscope reveals no pathological change in these structures save such as are found in the lining membrane of any infected accessory air cavity.

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MICROPHOTOGRAPHS.

1. Cross section of pneumatized turbinate which was the seat of chronic pathological process. The thin bony wall of the cell is here perfectly illustrated showing areas of rarefaction usually referred to as evidence of disease but illustrating nothing more than normal bone change to be found in all active turbinate bone tissue. Sections taken at this region in this specimen show bony wall to be incomplete above, which is the location of ostium of the cell. The marked concentric sub-epithelial edema of the lining membrane lifts the epithelium some distance from bone and nearly closes cavity with its swelling and is the only pathological change present. The external soft tissues present the same histologic structure found in any middle turbinate. Very Low Power.

2. Cross section of thin bony wall of dilated turbinal cell showing normal turbinate bone structure and illustrating area of osteoclastic activity with osteoclast invading the bone. This change has been interpreted as a sign of pathological change but is no more prevalent in this specimen than in any normally active turbinate bone. Oil Immersion.

3. Cross section of bony wall showing changes taking place in mucosa lining an infected turbinal cell. A high power view of No. 1. Note edematous infiltration between epithelium and bone, sub-epithelial structure consisting of loose fibrillar connective tissue markedly infiltrated with serum, numerous round cells throughout. The bone is normal, edema and increase in round cells are only evi-

dence of pathological change although the cavity was filled with mucous. High Power.

4. Showing epithelium of the interior of cell under high magnification. Note normal columnar epithelium with goblet cell formation resulting from secretory activity, no evidence of pressure from contained secretion as epithelium is not flattened. Note edema distending connective tissue spaces in sub-epithelial stroma. Oil Immersion.

PHOTOGRAPHS.

1. Cross section of dilated turbinal cell at its largest portion, showing empty cell cavity lined with thin layer of epithelium, thin bony wall of almost uniform thickness with normal turbinate mucosa covering outside of cell. No pathological change is to be noted in this section. Not a Microphotograph.

2. Cross section of dilated turbinal cell showing edematous swelling of mucosa lining cell, nearly filling same. Bone is thicker along lower border of turbinate than in No. 1, but is normal turbinate bone tissue. Edematous infiltration of cell lining is identical with the pathological change taking place in chronically diseased ethmoid cells, eventually resulting in polyp formation. Not a Microphotograph.

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PRESENTATION OF CASE, FOUR YEARS AFTER OPERATION, FOR LARGE SUBDURAL CYST OF THE FRONTAL LOBE.

Dr. William G. Shemeley, Jr., Philadelphia, Pa.

This case was shown before this Society in 1917 by Dr. G. W. Mackenzie, whose object in presenting the case was to show to what extent a careful eye, ear, nose and throat examination aids one in the diagnosis of intracranial conditions.

At the time the case was brought before the Society there had been a marked improvement in the case, but such a short time had elapsed that the question of permanency of relief could not be definitely answered.

The previous findings are given for the purpose of comparison with those made in February, 1922.

Examination, March 5, 1917: *Present condition:* The general appearance of the patient was that of pronounced emaciation; he had a shuffling gait (length of steps about eight inches), requiring two persons to lead and support him. His speech was slow and he had a vacant stare in his eyes, which suggested poor vision. He complained of severe pain on the right side of the head, centering especially in the temporal and frontal regions. During his attempts at walking, there was a tendency to pitch forward, due to an inability to balance himself. The same tendency was manifested if one pushed his body backward or to either side.

Examination of the cranial nerves gave the following findings:

I. Nerve: The patient was unable to distinguish between the odor of alcohol and catsup. His answers on repeated tests, with a few minutes' rest between, were occasionally given correct, but were always slow. Each side was tested separately and the patient's sense of smell seemed to be blunted on both sides. On the left side the blunting of the sense of smell may have been due in part to a pronounced obstruction from a deviation; the right side (concave side) was quite free of mechanical obstructions; however, there was considerable secretion. At the time of taking the sense of smell there was some question in my mind as to how much was due to an actual blunting of the sense of smell, how much to obstruction and how much to slow cerebration. Later on, I learned that the patient, under normal conditions, prior to and since operation, is a

Accepted for publication, Oct. 4, 1922.

slow and deliberate talker, but he is more prompt in his replies at this time (June, 1917) than he had been for some time prior to operation.

II. Nerve: Ophthalmoscopic examination O. D. Optic nerve showed extreme choking (elevation 6 to 7 diopters), as well as pronounced increase in circular dimensions (mushroomed). The outline of the disc was very poorly defined, apparently blending with the retina. The vessels on the disc were quite obscured, the veins in the retina markedly distended. The retina showed innumerable streak-like small hemorrhages, mostly surrounding the veins, while at the lower part of the retina there were some larger masses of hemorrhage; the upper margin of these were horizontal. There were a few small areas of pale-colored degeneration scattered between the disc and the macula. The distribution of these areas, however, was not of the classical albuminuric type. The vision O. D. was fingers against a black background about one foot (?), more often incorrectly estimated than correctly. O. S.—the ophthalmoscopic picture was the same as that of O. D. with the exception that the choking was less pronounced (4 or 5 diopters), the hemorrhages perhaps fewer, while the vision was about the same as that of O. D.

III, IV, and VI. Nerves: Mobility of the eyeballs normal, in that both eyes moved together and freely in all directions, with no evidence of strabismus; however, on examination for the lateral positions, there was an apparent aggravation of the physiological nystagmus. Pupils were both moderately dilated, the right more so than the left. Reaction to light was practically nil on the right side, but moderate on the left.

V. Nerve: No disturbance in tactile, pain or temperature sense on the two sides, nor was there any weakness of the muscles supplied by the motor branch of the V. nerve on either side.

VII. Nerve: The function of the mimic muscles on both sides equal and normal.

VIII. Nerve, Cochlear Branch: Hearing for conversational and whispered voice and acoumeter apparently normal on both sides. The fork tests gave normal findings in that Weber was not lateralized. The bone conduction was normal, Rinne positive 40 seconds, which is normal for the Politzer middle tone weighted fork that I use. Patient also heard the low and high forks normally.

VIII. Nerve, Vestibular Branch: The extreme headache which the patient was suffering, together with his inability to sit in the turning chair, made it impossible to conduct turning tests. Accordingly, the galvanic test, which I believe to be an easier and more

accurate method, was used. With the cathode to the right ear, the patient manifested a rotary nystagmus to the right with a current strength of 3 M. A. With the anode to the right ear, there was a pronounced rotary nystagmus to the left with a current strength of 3 M. A. On the left side the cathode produced a nystagmus to the left with 3 M. A. current, while the anode produced a rotary nystagmus to the right with 3 M. A. Prior to making these galvanic tests, the patient was tested for spontaneous nystagmus, which was not present when looking straight ahead. On looking to the right, there was pronounced nystagmus to the right, and on looking to the left, there was pronounced nystagmus to the left, as noted above; however, it was equal in intensity to the two sides. The disturbance in gait has already been mentioned.

There was spontaneous pastpointing inward, about 8 inches on both sides; that is, when the patient attempted to find the finger from above downward, he deviated inward with the right hand; also with the left hand, and the condition was to a like degree on both sides.

IX. Nerve: The sense of taste was tested with salt, sugar, alcohol and catsup, all in liquid form, with a small pledget of cotton wrapped on an applicator wire. The two sides were tested separately and the tips and the dorsum of the tongue were also tested separately and the mouth washed with water between tests. The replies were very uncertain and tardy. Comparing them with the control, they were much slower than normal, especially on the left side; however, there was not a pronounced variation on the two sides.

X. Nerve: Temperature 98°, pulse 64, respiration 24, and no vomiting up to the time of date of this examination; however, there was one attack of what the nurse reported as expulsive vomiting as the patient reached the hospital and prior to his operation.

XI. and XII. Nerves: Normal findings.

The general muscular condition of the patient was fair and equal on the two sides; that is, the extensors, flexors, supinators and pronators were tested and found to be weaker than the average, but equal on the two sides. The same applies to the hand grip.

The arms, legs, chest and back were tested for disturbances in the tactile, pain and temperature sense, but none were found.

The speech center was found to be normal, in that there was no motor or sensory aphasia nor was there any paraphasia; furthermore, the family was questioned on these points and replied that they had not noticed any disturbance in his speech or in his identification of articles. On the other hand, there was a slight hesitancy in his speech that the family had noticed which the patient did not show before his present illness.

Examination of the nose revealed a pronounced deviation of the septum to the left, as noted. On the right concave side there was a moderate compensatory hypertrophy of the inferior turbinate and a moderate amount of secretion in the region of the middle meatus. The appearance of the stump of the middle turbinate suggested that it evidently had been amputated, because of previous hyperplasia. The mucous membrane on both sides of the nose was somewhat pinker and more turgescent than normal.

Examination of the mouth revealed three scattered wounds in the alveolar process of the upper jaw, due to the recent extraction of teeth. The tongue was slightly coated, of a gray color, and was protruded straight forward with a slight, coarse tremor. He could extend his tongue and move it to the two sides freely and to a like degree. The soft palate moved freely and did not deviate during the phonation of the letter *a*.

Otoscopic examination: Right ear—tympanic membrane intact, brilliant, fairly opaque, no retraction, normal mobility with Siegle. By Politzer inflation, the membrane moved outward freely over a large area and went back somewhat slowly, especially in the posterior half, indicating a somewhat relaxed condition of the membrane.

Left ear—Membrane intact, brilliant, slightly opaque in the posterior half; however, sufficiently translucent to permit a view of the long process of the anvil. Mobility normal with the Siegle. By Politzer inflation the membrane moved outward freely and went back promptly.

Urinary examination, March 5: Amount, 4 ounces. Sp. Gr. 1009. Reaction, faintly acid. Odor, none. Color, light amber. Transparency, clear. Sediment, heavy grayish white flocculent. Albumen, trace. Sugar, negative. Urea, 0.010 gms. per c. c. Indican, negative. Bile, negative. Urobilinogen, negative. Blood, negative.

Microscopic—An abundance of amorphous urates, many epithelial cells (mainly bladder), a few renal cells, an abundance of bacillary bacteria, few uric acid crystals.

Wassermann examination, March 13, 1917: Made by the Philadelphia Clinical Laboratory. Reaction, negative. Antigen I. (Cholesternized), negative. Antigen II. (Alc. syph. liver), negative. Antigen III. (Acet. insol. lipoids), negative.

From the symptoms and signs the diagnosis was made of a tumor of fair size, located in and about the right inferior frontal convolution.

Patient operated March 16, 1917, at which time a large subdural cyst was opened. Subsequently discovered to be traumatic in origin.

On March 17 the patient's pulse, temperature and respiration were normal. There was slight edema about the right orbit; otherwise, he said he felt comfortable and remarked that he could see better.

On March 18 the patient's condition was improved from every angle. The wound was redressed and showed no evidence of excessive reaction. After this date the wound was dressed every day. The headache had entirely disappeared and he noticed that his vision was constantly improving.

On March 19, the wick was partly withdrawn and the following day removed entirely. At this time his gait had so improved and he felt strong enough to walk from the ward to the operating room for redressing. On the 24th the wound was quite healed. There was no secretion, his vision had improved and he was discharged from the hospital. Two weeks after the operation, the patient walked from his house to the office, accompanied, but unassisted, a distance of about three miles.

On March 28 the patient was re-examined, and the sense of smell, although not perfect, was much better than on his first visit. The optic nerve, O. D., was still swollen about 3 diopters. The blood vessels on the disc were seen more distinctly than they were on the first visit. Hemorrhages were considerably diminished in number, and the patient's vision improved to fingers at one meter. O. S., disc swollen about 2 diopters, the same general appearance as in O. D., but less pronounced. Vision, with correction that he had been wearing, 6/30.

The sense of taste was positively improved over that which it had been prior to operation.

The remaining cranial nerves normal. The patient had gained 10 pounds in weight and was physically much stronger than before operation, and entirely free of headache.

On April 21 K. 1 was administered in 10-drop doses, t. i. d. in the hope of clearing up the slight remains of edema of the disc. The patient reported at the office about twice a week from then on until May 19, when he was refracted with a mydriatic. The vision in right eye was 6/60. It was impossible to improve the vision in this eye with any glass. O. S. + 1.87 D sphere + .50 D cyl. ax. 105 gave a vision of 6/12. With 4.00 D sphere added, the patient was able to read ordinary newspaper type. The patient observed his central vision was poor, as compared with that directly around it. He stated that he loses fixation of objects when he looks directly at them, but when he directs his vision away from the center, he reads better than when looking directly at it.

The urinary examination made on May 5 was as follows:

Urinary examination, May 5, 1917: Report of the Philadelphia Clinical Laboratory: Color, light yellow. Consistence, clear. Reaction, acid. Sp. gr. at 15° C.—1018. Robert's test for albumen, not found. Robert's test for heat + H No. 3, not found. Benedict's test for sugar, not found. Casts, not found. Urates amorphous, present. Crystals, not found. Large squamous epithelial cells, few found. Leucocytes, few found.

By ophthalmoscopic examination there was no evidence of swelling of the disc, distention of the veins or hemorrhages.

Since May 19 the patient reported every week or 10 days up to June 16. His vision is still improving, so that now he reads 6/12 with ease, and is discharged as cured.

February 27, 1922.

History (as related by patient): Patient reports that he felt fairly good up until two weeks ago, at which time he developed a heavy cold; developed high temperature (patient's statement). He remained in bed three days. Patient reports that he feels fair. His headache was over his left eye; for several days the eyeball was sore. Patient reports that his vision is much better now than before the operation. Patient answers promptly and intelligently.

Examination, Nose: Deviation of the septum to the left; polyps visible on both sides around the region of the middle turbinate.

Throat: Secondary catarrhal pharyngitis; teeth in poor condition —pyorrhea.

Otoscopic A. D.: Membrane intact, slightly dull, opaque; long process of the anvil not visible. Retraction. Posterior fold present. With Siegel otoscope, normal mobility; with Politzer inflation, membrane came out promptly over fair area and returned promptly.

A. S.: Membrane intact; slightly dull, opaque; long process of the anvil not visible. Retraction. Posterior fold present. With Siegel otoscope, normal mobility; with Politzer inflation, membrane came out promptly over fair area and returned promptly.

Weber
n Schwabach n
+30 *Rinne* +32
sh 5″ Air n
sh 10″ C sh 10″
n c n

I. Nerve: Patient was able to distinguish the odor of ground coffee and gasoline. Answers were prompt. However, in tests made in subsequent days his sense of smell appeared blunted; this was thought to be due to the presence of a hyperplastic ethmoiditis.

II. Nerve: *Ophthalmoscopic Examination:* Media, clear O. U.

Direct O. D.: Disc elongated, slightly; axis 100°, poorly defined. There is a degenerative area extending from about 9 to 11 o'clock. Lamina cribosa, not visible. Physiologic cup appears to occupy the whole diameter of disc; connecting tissue fills the cup, but does not extend far beyond the disc. The disc is slate color. Vessels, both arteries and veins, are smaller than normal, but preserve their normal relationship as to size. In the macular region there are several dark areas of rather dusky red color.

Direct O. S.: Disc round; poorly defined. Pigment crescents, temporal edge of the disc. Disc is somewhat the same slate color as O. D., but less marked. Lamina cribosa, not visible. Physiologic cup appears to occupy, more or less, the entire diameter of the disc, filled with connecting tissue. Degenerative area about 8 o'clock, apparent at margin of the disc. In the macular region there are apparent several small spots that have the appearance of old hemorrhages. Vision: O. D. with glasses 6/20. O. S. with glasses 6/6.

III., IV., VI. Nerves: Mobility of eyeballs, normal. No evidence of strabismus. Exaggerated physiologic nystagmus in extreme latent positions. Pupils dilated. Reaction to light on the right side is prompt, and also on the left side.

V. Nerve: Tactile, pain and temperature sense on the two sides normal. Motor branch of the V. nerve normal.

VII. Nerve: Mimic muscles normal on both sides.

VIII. Nerve: *Cochlear Branch,*—Normal. *Vestibular Branch,*—Normal. Hesitancy of gait; due to poor vision.

Examination for Spontaneous Nystagmus: When looking to the extreme right there is a mixed horizontal and rotary nystagmus to the right. When looking to the extreme left there is a mixed horizontal and rotary nystagmus to the left. The nystagmus is a trifle exaggerated, above that which we call normal, but is equal to the two sides. No spontaneous nystagmus when looking ahead.

Galvanic Test: Right Ear,—Kathode to the right ear 3½ ma. of current, produced a rotary nystagmus to the right.

Anode to the right ear, 4 ma., gives a rotary nystagmus to the left.

Left Ear: Kathode to the left ear, 3 ma., gives a rotary nystagmus to the left.

Anode to the left ear, 3½ ma., gives a rotary nystagmus to the right.

Turning Tests: Head Erect: 10 turns to the left gives a horizontal after-turning nystagmus to the right, lasting 22 seconds. 10 turns to the right, gives a horizontal after-turning nystagmus to the left,

lasting 24 seconds. *Head Forward:* 90°: 10 turns to the left gives a rotary after-turning nystagmus to the right, lasting 20 seconds. 10 turns to the right gives a rotary after-turning nystagmus to the left, lasting 19 seconds.

Past-Pointing Tests: Normal, with eyes open and closed.

Gait: Fairly normal; slight hesitancy is probably due to poor vision in the right eye.

IX. Nerve: Normal, to salt and sugar.

X. Nerve: Temperature 98 4/5° F. Pulse 70, full, regular and compressible. Respirations 22, easy and regular. Larynx, normal.

XI. Nerve: Normal.

XII. Nerve: Normal.

CONCLUSION.

1. Cysts, subdural in character and traumatic in origin, are relatively benign.

2. Properly operated, they do not tend to recur.

3. If the pressure upon nerve structure is continued long enough to produce definite change in cell structure, then the loss of function resulting will tend to be permanent.

4. A carefully conducted eye, ear, nose and throat examination is of great aid in the diagnosis of intracranial conditions.

1831 Chestnut Street.
1724 Spruce Street.

THE PRESENTATION OF A THEORY EXPLAINING A PHASE OF TINNITUS AURIUM.

DR. OLIVER A. LOTHROP, Boston, Mass.

Tinnitus aurium is a very common subjective symptom of abnormal sound perception in patients suffering from aural disturbances and is the result of many different causes. It is observed in cases of acute otitis media, cases of eustachian salpingitis with insufficient air pressure in the middle ear and to a greater extent when hydrops ex vacuo exists. Cerumen, insects and foreign substances in the external auditory canal frequently produce abnormal sounds. Another group of causes results from various stimulations of the labyrinth, produced by drugs, such as quinine and the salicylates. Toxins from different infections, auto-intoxication from various disorders in any part of the body, anemias, brain tumors,

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diseases like syhilis, intra-cranial and local arterio-sclerotic and senile changes and otosclerosis may cause at any time adventitious sounds variously described. Prolonged stimulation of the labyrinthine cells by loud vibrations and traumatisms from explosions may cause tinnitus. In another group may be mentioned the abnormal perception of normal body sounds. Fatigue and debility accentuate most all forms of tinnitus.

In addition to the long list of known causes given above, there remains a large group to be accounted for in the following theory. In this group there is slight to a marked loss of hearing associated, the onset is generally insidious, and the malady is persistent over a long period and is obstinate to treatment. The sounds are generally high pitched, ringing, singing or buzzing similar to the escape of air or steam from a small opening or may be similar to the sea shell sound. The eustachian tubes, in the later stages at least, are usually patent and clear, and examination through the external auditory canal reveals a normal condition or slight to marked thickening and retraction of the drum membrane. The theory of the condition explaining this form of tinnitus is as follows:

Normally the air pressure in the external auditory canal and in the middle ear is the same. The drum membrane, the articulations of the ossicles, the membranous attachment of the foot plate of the stapes in the oval window and the membrane filling the round window are all freely movable and respond to the slightest vibration. The tensor tympani and stapedius muscles keep this ossicular chain in perfect equilibrium. Under these conditions there will be no stimulation reaching the labyrinth except from vibrations acting on the drum membrane.

When, however, pathological conditions supervene and cause a displacement of the tympanic membrane, ossicles, and ligaments, or any adhesions form involving the sound conducting apparatus, an abnormal position of the tensor tympani and stapedius muscles must result and the normal balance is destroyed, and an abnormal pressure is brought to bear on the intra-labyrinthine fluid. Any pressure on the labyrinthine fluid will produce the sensation of sound the same as pressure on the vitreous humor of the eye will produce an abnormal sensation of light, but in the labyrinth a constant pressure cannot be maintained because some of the fluid can escape through the aqueductus vestibuli and restore the normal pressure; therefore, we must look further for the reason to explain a continued stimulation.

A displacement of the drum membrane and ossicular chain caused by atmospheric pressure, produces a relaxation of the tensor tym-

pani muscle and the fibres must retract in order to be in a favorable position to function as a tensor of the drum. Since displacement of the drum and ossicular chain is the result of a chronic process, the restoration of normal pressure is not accompanied by a return of the muscle to its normal position. Other changes complicate the picture because ligamentous and articular changes also take place as the result of a chronic dislocation of the sound conducting apparatus. Changes also take place in the stapedius muscle.

Pathological changes similar to this but on a larger scale are seen in other parts of the body. If a leg is immobilized in a plaster cast for a moderately long period, with the foot extended, the gastrocnemius and soleus muscles retract and the heel can not again touch the ground until a stretching or a tenotomy of the tendo achilles is performed.

Every physician has placed his stethoscope on a muscle while it is being voluntarily contracted and heard the intermittent vibration, showing that either the nerve impulse or the muscle contraction is not a steady, prolonged impulse, but a rapid series of impulses or contractions. So also in one or both of these muscles of the ear, there are vibratory impulses trying in vain to re-establish an equilibrium by pulling against the ever contracting adhesions and the unbalanced and dislocated ossicular chain, and thus this persistent intermittent vibration of the muscles acting against an unbalanced ossicular chain and elastic adhesions produce a vibration in the labyrinthine fluid which cannot be equalized, and from that vibration arises one cause for the subjective symptom of tinnitus aurium.

Should an equilibrium be established, however, even in the presence of a dislocated sound conducting apparatus, no tinnitus would exist, for the stimulation of the labyrinth can take place only so long as there is an antagonism between the muscles and the adhesions or tenseness of a dislocated sound conducting mechanism.

In cases where the drum membrane, malleus and incus are absent, a similar stimulation may persist to a lesser degree as the result of a tension between the stapedius muscle and adhesions about the foot plate of the stapes.

101 Beacon Street.

MODIFICATION OF DIRECT LARYNGOSCOPE.

Dr. A. Ellis Goodloe, Chattanooga, Tenn.

The accompanying drawing illustrates a modification of a direct laryngoscope, which has been designed by the writer and in use for two years, in which time it has proven to be very satisfactory, and I believe it may be of interest to others engaged in this field of work.

There are a number of features in common with other laryngoscopes, but I am aware of none that contain the same combination and I have added some that are found in none, so far as I have been able to ascertain, and I present them as follows:

1. It has within the handle (A) a dry cell battery with a rheostat so arranged that by simply turning the handle, the light is turned gradually on or off. This can be done while in use with the left hand without interfering with the support and is of advantage many times in regulating the light to just that degree which is best suited to the eye, as often when the light is turned on before beginning work, we find that it is either too bright or not enough. Also by having the cell within the handle, the instrument is complete within itself, thus doing away with separate battery holder and cords. During general anesthesia, should there suddenly develop asphyxia from obstruction in the glottis from any cause, the laryngoscope could be inserted in a few seconds and the cause of the obstruction quickly seen and removed. There are other advantages which are self-evident.

2. The slant given the part (B), instead of leaving the blade at right angle, increases the power and is of decided advantage in overcoming the powerful muscles of the neck, especially in adults. Also requiring less movement at the wrist in elevating the point of the blade.

3. The gnarled or serrated handle gives a firm and non-slip grip.

4. Space is economized to the greatest degree possible, as is seen in cross section at proximal end (C), which I have shown in insert. The artist failed to show this in the original drawing. It will be seen that instead of its shape being round or oval, that the upper and lower parts are straight and parallel to

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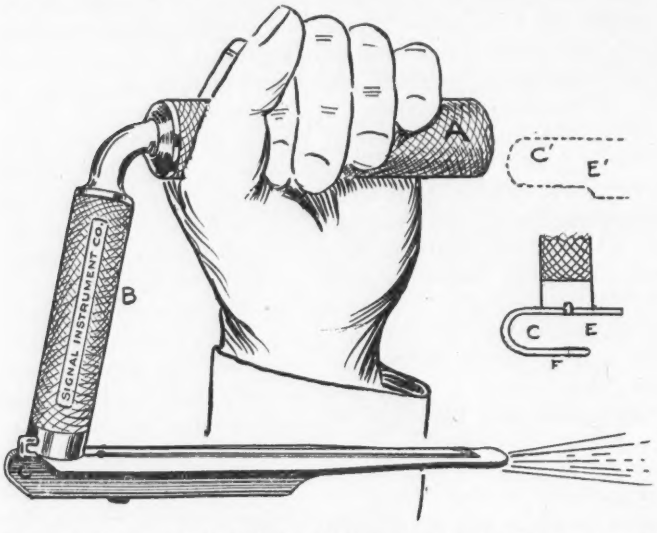
each other. In a given space between the teeth, this gives the greatest amount of space for vision and operating possible. The shelf (D) holds the tongue well out of the way and to even give added room for instrumentation, the part (F) is carried no further than the center. This gives slightly more room for instrumentation to the extent of the thickness of the part, and if the teeth are lower at the side than in the center or are missing, then this space is much greater. A small distance of one or two mm. means much at times. A bronchoscope one or two mm. larger can be inserted at (E) that could not be inserted



through (C). It is of distinct advantage in intubation, by the direct method, especially with the larger tubes.

5. It is easily removed after the bronchoscope or esophagoscope has been inserted without interference, as the slit of exit at the side is greater than the lumen or the space between the two walls.

I have endeavored to represent by dotted lines the space for vision (C), and for operating or instrumentation, the space (E).

There are two sizes, adult and child's.

Suite 521, James Bldg.

THE WARING SUCTION TONSILLECTOMY.

Dr. J. B. H. Waring, Blanchester, Ohio.

With our increased knowledge of infective processes in general, and especially with the elaboration and wide acceptance of the Focal Infection Theory by the profession today, the tonsil—or rather the pathological tonsil, takes on a more important aspect than it had in former days. As appendectomy has become a fairly common surgical procedure today with brilliant recoveries in the vast majority of cases where a decade or two ago chances of recovery would have been far less in those same cases, so it has become with tonsillectomy. With our greatly increased knowledge of the tonsil and the pathologic processes to which it is subject, operation today is done very often, and with brilliant results both in children and in adults.

Inasmuch as tonsillectomy has become a very common operation nowadays, any simplification or improvement in technique is bound to prove of benefit both to the surgeon and to the patient. The operation today is performed not only by the throat specialist, but perhaps equally so by the general surgeon, and often also by the general practioner. We should all endeavor to have tonsillectomy regarded as more of a difficult surgical procedure of major proportions, rather than as a piece of minor surgery to be performed with nonchalance by any holder of an M. D. degree.

Many new methods of tonsillectomy have been presented to the profession in the last decade or two, all most enthusiastically indorsed by their sponsors; all of them have had some merit, and some much merit. In a general way it may be said that almost any of these various techniques gives good results in the hands of experts, after the technique has been worked out by the given operator in a sufficient number of cases. Most of these techniques to date, however, have certain inherent difficulties of execution, which render them more or less unsatisfactory or uncertain in the hands of the beginner certainly, and likewise in the hands of the occasional tonsillectomy operator, of whom there are legion. The present array of tonsillotomes, tonsil grasping forceps, tonsil haemostatic forceps, retractors,

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hooks, scissors, knives, etc., is truly formidable; as may be glanced from the pages of our surgical catalogs. Each one, of course, represented as the best, each one without a fault; but their very multiplicity proves the opposite.

Tonsillectomy techniques may roughly be divided into two classes. First; some form of snare and dissection; and Secondly; some form or modification of the old Mackenzie tonsillotome and technique—perhaps best represented today by the ingenous technique developed by Sluder, with its many further modifications by this and that operator. Of the various Sluder modifications, that of Beck may perhaps be regarded as one of the best and most widely used; in a way, though, the Beck instrument may be regarded as merely a modified snare, employed somewhat after the Sluder technique.

The Mackenzie tonsillotome of itself, may be regarded as obsolete today; likewise the so-called finger-nail enucleation of the tonsil may be dismissed as unscientific and unsurgical. Although the writer has seen apparently perfect, bloodless enucleation of tonsils by the finger-nail method and by rank beginners at that; it is a method—if it may be graced by such a name—that does not appeal to a man of good surgical training, and would hardly be used by an operator of experience and judgment.

Removal of the tonsil by the actual cautery is another method which has not found favor with the profession; and X-ray and radium removal of the tonsils, are two methods in their infancy and will hardly find widespread usage by the profession, to judge from present outlook.

By a process of elimination, so to speak, we return to our snare and dissection and some form of Sluder operation.

Snare and dissection is perhaps most widely used today in tonsil enucleation, and the method has much in its favor; on the "right kind of tonsils" and in the hands of experts, this technique gives excellent results, is fairly simple, and its rapidity so enhanced by some operators as to be almost spectacular. With the small, buried or deeply adherent tonsils, however, it is a horse of another color, and is often time-consuming, bloody and far from perfect in its end results. Working in a field covered with blood and mucus, this technique often degenerates into a cutting rather than a dissecting operation; even with the modern suction cleansure of field of operation, it is often still

very difficult of execution, particularly in children, where the mouth and pharynx is small. Frequently in this operation much time is consumed in attention to hemostasis, and where general anesthesia is employed, time under anesthesia much lengthened and danger of an aspiration pneumonia or possible pulmonic abscess accentuated. Under local anesthesia, the snare and dissection technique is often trying on both patient and operator; and the same difficulties, but in lesser degree perhaps met as under general anesthesia.

The writer well recalls a year of his apprenticeship spent with a specialist of good training and experience, who apparently was firmly wedded to snare and dissection under general anesthesia for any and all tonsillectomy cases, young and old. The assistant's major task at operation was to keep the throat and field of operation swabbed clean and free from blood and mucus, of which there was more than plenty once dissection hostilities had begun. Often it was a question as to whether the nurse assistant could furnish fresh swab forceps fast enough to prevent complete inundation of the field of operation. Much time was necessarily lost in this swabbing procedure, and at the end of an operation perhaps a hundred or more blood-stained swabs were in the bucket, on the floor and all about. The modern suction pump apparatus, of course, obviates a good deal of the work of keeping field of operation clear. After each tonsil was enucleated, the floor of each tonsillar fossa was carefully crocheted with a network of black silk sutures. Bleeding, if any, was certainly most thoroughly stopped by this procedure, but often an hour or more was consumed in the one tonsil operation. Perhaps in the above, the disadvantages of snare and dissection have been somewhat exaggerated by way of illustration, but in the hands of the average operator, this technic certainly leaves something to be desired.

Turning to the Sluder technic, it must be admitted that this operation is most ingenious in its various modifications, and on suitable cases highly spectacular. Unlike Snare and Dissection, the Sluder operation is more of a One-Man Job and a retinue of assistants and nurses not so absolutely necessary as with Dissection work. On suitable cases, the Sluder or Sluder-Beck operation is clean, rapid, and practically bloodless where the dull blade or combination of sharp and dull blade is used, as in the LaForce instrument. On a certain proportion of small,

deeply buried or badly adherent tonsils, the Sluder operation is unsatisfactory if not entirely inapplicable; on such tonsils and especially in the hands of operators not finished experts, the top of the tonsil is merely shaved off, leaving base of tonsil to be dissected out afterwards. Sometimes in this operation one or both pillars are damaged; the anterior being quite frequently buttonholed, and even completely removed. With the so-called Sharp Sluder, free, hemorrhage sometimes follows, and requires energetic hemostatic measures. The dull Sluder or Beck technique is practically bloodless in the majority of cases. The Sluder technique is rather difficult for the average operator to correctly acquire, as it calls for considerable man-

ual strength and dexterity in manipulation; likewise the Beck instrument presents certain mechanical difficulties, often hard to overcome. On appropriate tonsils, and in the hands of an experienced operator, however, it does admirable work and is rapid, clean and practically bloodless.

With the difficulties and disadvantages of the snare and dissection and Sluder-type of tonsillectomies in mind, it has been the writer's object to develop a tonsillectomy which has all the advantages of the two older operations, with elimination of their defects and difficulties.

In usage of the ordinary Hurd glass tonsil suction tube for diagnostic and therapeutic purposes on tonsils of all types, sizes

and condition, strong impress was made not only with the gross mechanical "vacuum cleaner" cleansing of the tonsils by suction; but more especially with the ease and completeness with which the tonsils were drawn out of their beds and securely held in mouth of the suction tube while suction was applied from a suction pump connected up by flexible rubber tubing.

Pus, caseous masses and ill-smelling purulent exudate were drawn out of tonsils—often in most surprising and unsuspected amount—and into the suction tube; thus cleansing the tonsils of much potentially infective material, which otherwise in time would be swallowed, or more or less reabsorbed into the general circulation.

Preceding tonsillectomy by any method, it is the writer's firm belief that this "vacuum cleaner" mechanical cleansing of tonsils, could well be made a preliminary step in technique.

Even with the small, buried, or deeply adherent tonsils, and likewise with the ragged type tonsils, it was found the suction tube drew these tonsils out of their beds most effectually, and held them there easily and firmly; there was no laceration or shredding of tonsil tissue, as so often happens with the various tonsil forceps pulling out time and time again. The tonsil was held firmly; yet could be instantly released by disconnection of suction tube to pump, and as easily re-ingaged. High visibility was another point which appealed strongly. With the transparent glass suction tube, you could see what you were doing all the time.

From this step it was an easy matter to throw a snare loop over the glass suction tube, down over the base of tonsil held in suction tube mouth, and thus enucleate tonsil at will.

Developmental work was done with the Hurd glass suction tube, but in a fairly large percentage of cases, it was found difficult to throw snare loop completely over end of tube and on to base of tonsil to be enucleated; in such instances, as the snare loop was tightened down, it would hang up on end of the Hurd tube and slip down towards its sloping neck, instead of over base of tonsil. To overcome this, the only mechanical difficulty encountered in working out the operation, the writer designed a tonsil suction tube with bulbous mouth, and shoulders sloping rapidly down towards mouth of tube, which was made oval from top to bottom. For ease of manipulation, a rubber tube handle is placed over shaft of each tube, and a set of four tubes,

of varying tube mouth size made to accomodate all sizes and shapes of tonsils. Any of the loop or ring-type tonsillotomes are applicable, but the snare is perhaps most used today in tonsil work, and will be described in operation.

The tonsillectomy method developed by the writer, is new so far as search of the literature disclosed, and is therefore termed the Waring suction tonsillectomy. Practically all well-equipped physicians' offices today contain a compressed air and suction pump apparatus of some sort, and any of the modern air pumps affording sufficient suction to firmly grasp and hold tonsil in suction tube, are applicable. About 20 to 25 inches is usually sufficient.

Where general anesthesia is employed, a vacuum bottle of about one pint capacity, may be incorporated in the suction circuit between suction tube and suction pump, at any convenient point, and the suction tube employed from time to time to keep the field of operation entirely clear of mucus and saliva.

Where local anesthesia is employed, the field of operation is first anesthetized by whatever technique the operator is accustomed to; under local anesthesia the operation is essentially a one-man job; where general anesthesia is employed, an assistant is desirable to administer the anesthetic. Owing to rapidity of the operation, only a comparatively light general anesthesia is necessary.

The patient having been prepared for operation under local, or general anesthesia as the case may be, an appropriate sized Waring suction tube is connected up to suction pump by flexible rubber tubing of sufficient length for ease of operation. Any of the modern snare, loop or ringed tonsillotomes are applicable, such as the Sluder, Beck, Meding, La Force, etc. In some ways the open snare can be used to best advantage, and as the open snare is perhaps most widely used today, the operation will be described with the snare. The author has found the Beck-Pierce tonsillotome, using the open snare, to be very satisfactory; this is particularly so because the tonsil can be enucleated rapidly or slowly, as is possible with the Beck ratchet arrangement. This enables a practically bloodless enucleation to be done in almost every case. About a No. 8 snare wire is best.

The glass tonsil tube is passed through loop of snare, which is now allowed to hang freely suspended from shaft of tonsil tube and out of the way until ready to be used.

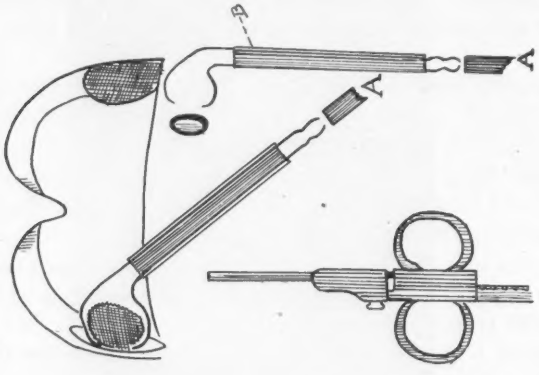
Under direct inspection the suction tube mouth is passed into the mouth and between the pillars of the throat and over the tonsil to be enucleated, usually the right first.

Suction is now turned on, when it will be seen the tonsil, even where deeply submerged, is drawn completely out of its bed and held firmly grasped in mouth of suction tube. There is no danger of injury to pillars, uvula or other throat structures, as the clear glass of suction tube gives high visibility; every step of the operation is under direct inspection and at all times the operator can see exactly what he is doing. Although grasp on tonsil may be instantly released at any time desired by disengaging suction tube from rubber tubing to suction pump, there is no pulling out or shredding of tonsil tissue as so often happens at the crucial moment with even the best of tonsil seizing forceps. At will the tonsil may be instantly re-engaged by holding tube mouth over tonsil and turning on suction again.

The tonsil having been properly engaged in mouth of suction tube, the tube is now lightly steadied in the right hand for the right tonsil, and the snare taken up in the left hand; the reverse when enucleating the left tonsil. The snare loop is now carried over end of suction tube and down over base of tonsil; with the bulbous shape and sharply sloping shoulder of the Waring suction tube, this step is very simple, and as the snare loop is

tightened down it is automatically carried down over base of tonsil and tightened until the tonsil is enucleated rapidly, or slowly, as is possible with the Beck and similar instruments. This makes a practically bloodless operation in all cases, and it will be found the tonsil is enucleated smoothly and cleanly, with no damage to contiguous structures. Where rapidity is desirable, either tonsil may be enucleated in less than one half a minute, and with good, clean fossae convalescence is rapid, the pillars intact and a most grateful patient with little complaint of post-operative sore-throat.

Where the rapid snare is used, the enucleated tonsil is removed, grasped in mouth of suction tube, which has been held



in the hand not engaged with snare. Where slow enucleation is employed as with the Beck instrument, after the snare loop is tightened down over base of tonsil, the suction tube is released from the grasp and both hands thus employed in steadying and turning the ratchet screw of Beck instrument. The second tonsil is enucleated in same manner as the first.

The operation is applicable to all types of tonsils, but will demonstrate its superiority in small children, where the field of operation is so constricted; and especially on the small, deeply buried or badly adherent tonsils so often met with.

After treatment may follow whatever routine the individual operator is accustomed to; there is practically never any primary bleeding to speak of, and there has never been any tendency to secondary hemorrhage after this operation. I usually exhibit Calcium Lactate in appropriate dosage four or five days

prior to operation, and a coagulation-time test may be employed to advantage in all cases before operation. For any oozing in fossae after operation, Monsell's solution in glycerin will be found a very effectual hemostatic. There is very little complaint of post-operative sore throat, and convalescence usually uneventful.

Advantages of the operation over existing techniques, are that it is so simple the operator of even limited experience can operate rapidly, safely and with uniformly good results; while the expert can do better, cleaner and more rapid enucleations by this method.

High visibility is another strong feature of the operation; at all stages of enucleation, the operation is under direct inspection of the operator. It is practically bloodless in all cases, so that no time is lost in attention to post-operative hemostasis. It is so rapid as to be practically shockless, even in the neurotic or aged, and time under general anesthetic markedly shortened. It renders tonsillectomy essentially a one-man job, and does not require the elaborate array of tonsil instruments sometimes seen at tonsil operation. The technic is simple, easily acquired, and does not require the prolonged training and experience necessary to attain competency with some of the existing tonsil operations. It is equally applicable to all types and sizes of tonsils, but is of especial value in the deeply submerged and adherent tonsil, so difficult of attack under ordinary methods.

The Waring tonsil suction tubes are made either of metal, or all glass with rubber tube handle, and in sets of four sizes to accomodate all sizes of tonsils to best advantage; in opinion of the author the glass tubes are far the most satisfactory because of the perfect visibility afforded at all stages of operation. These tube sets have been developed according to the author's design, by the MIM Company, 634 Woodward Building, Washington, D.C.

109 East Main Street.

THE STUDY OF THE MECHANISM OF PAIN AS SEEN IN OTOLOGICAL CASES.*

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Pain is an important and dominant symptom in many affections of the nose, throat and ear. Few problems in our specialty are more difficult and involved than those centering about its interpretation. It is the purpose of this communication to give as clear an understanding of its mechanism from the otological aspect as the present state of our knowledge permits.

There is a misconception of what is generally meant by the term "true pain," as nearly all sensations, somatic, autonomic (visceral), and special, appear to have an agreeable or disagreeable quality. The stimulation of some sense organs, however, like those of the tympanic membrane,[1] the cornea, the tooth pulps, and the "pain spots" on the skin, results in a true specific sensation of pain with no other quality recognizable. This would suggest that there are special sense organs or nerve endings for pain as for other senses. These pain sense organs are of very simple conformation, in contradistinction to the more or less complicated structure of other sense organs. They consist of very fine nerve filaments ending "free" between the epithelial cells of the mucous membrane or skin. Wherever found, they are considered to be the specific pain sense organs.

Many other sensations, besides those that are specifically painful, may be accompanied by a discomfort or unpleasant feeling. This discomfort may be associated with touch in the form of itching or tickling, with pressure in the form of pressure pain and with heat in the form of burning pain. In other words, a stimulus of low intensity to a particular area of the body causes a sensation of touch or pressure or warmth, and if this stimulus is increased in intensity, then itching, tickling or pressure pain or burning pain is produced, depending upon what sense organs are irritated.

In order to understand the mechanism of pain in general, it is well to divide it into three types: first, somatic pain; second, autonomic (visceral) pain, and third, psychic pain, as the mode of production of these three types differs.

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Mechanism of Somatic Pain. There are special sensory nerve endings (sense organs) at the periphery capable of receiving the special stimulation and probably special nerves for the conduction of the pain and the discomfort. These conductors are afferent somatic neurons which pass into the central nervous system by the posterior nerve roots and finally reach the optic thalamus (containing the pain center) and the cerebrum. The latter becomes conscious of the stimulus and recognizes the place from which the stimulus arose. If the specific pain nerve endings are irritated a sensation of true pain is conducted along the "pain fibres" to the central nervous system. If the nerve endings for touch are irritated a feeling of itching or tickling is carried along the "touch fibres" to the central nervous system. If the nerve endings for pressure are irritated a sensation of pressure pain, and if the nerve endings for heat* are irritated a sensation of burning pain is conducted along the "pressure" and "heat" fibres, respectfully, to the central nervous system.

According to the researches of Henry Head and his collaborators[2] this peripheral mechanism is not so simple as is stated here. They believe that no one sensory quality is subserved by a single set of endorgans, but that every specific sensation is the result of the combined activity of more than one set. In the central nervous system, however, the various sensations arrange themselves according to quality, *e. g.*, all impulses capable of generating pain become grouped together in the same path.

Mechanism of Autonomic (Visceral) Pain. Afferent impulses from internal organs do not normally reach consciousness, but under abnormal condition afferent impressions from these organs are capable of arousing pain and discomfort. It is known that viscera are insensitive to stimuli that produce pain in tissues supplied by somatic afferent neurons. It is also known that pain can arise from visceral disease or certain forms of irritation, for instance, stretching or tension. It, therefore, follows that the mechanism by which autonomic pain is produced must be somewhat different from the mechanism by which somatic pain is produced.

The impulses, capable of producing autonomic pain, most probably arise in afferent autonomic nerve endings of the viscera. They pass along the afferent autonomic nerve fibres, which have their cell bodies, like the somatic afferent fibres, in the posterior (sensory) root ganglia.[3] When the cells in these sensory ganglia are stimulated pain arises. The cerebrum recognizes this pain and

*There is no histological, but only physiological evidence that heat nerve endings are present.

forms a judgment of its locality. That locality, however, is not the region where the pain stimulus arose, but in the peripheral distribution of the somatic sensory nerves, whose cells in the posterior root ganglia had been stimulated. This is the reason why autonomic pain is called referred pain.

As oto-laryngologists, viscera do not concern us, but we are interested in structures that are visceral in origin, *i. e.*, those that are developed embryologically from the branchial arches and pouches. It is probable that these structures are also supplied with afferent autonomic fibres. Irritation of the latter may produce referred pain. It is known, however, that these structures receive most of their sensory supply from somatic nerves, and that most of the pains are due to a disturbance of these nerves.

It is impossible to distinguish from the character of the pain whether it is of autonomic or somatic origin. But when the pain is referred to regions far removed from the distribution of the somatic sensory nerve of the diseased area, it may be considered as referred pain of autonomic origin.

Mechanism of Psychic Pain. Psychic pain may be regarded as the outward manifestation of a neurotic conflict. If a person is confronted with a mental conflict which he er she cannot handle in a conscious way, there occurs a suppression of this conflict. The first result of this suppression is a disturbed feeling of well-being. Patients of this kind "feel" sick, but they cannot discover the real reason for it. To explain to themselves and to others their disturbed feeling of well-being, they develop certain symptoms. The most common of these is pain.

Psychic pain has its origin in the cerebral cortex and from here is projected to the periphery. Its location and character depend upon the ideas the patients have about it, and upon the extensiveness of their vocabulary. Neurotic patients do not distinguish between discomfort and pain. Every itching, scratching, even tinnitus aurii they call pain.

Differential Diagnosis between Psychic and Organic Pain. 1. Psychic pain is a cortical pain, *i. e.*, impulses are transmitted from the cortex to the periphery. Organic pain is an optic thalamic pain, *i. e.*, impulses are transmitted from the periphery to the pain center in the optic thalamus.

2. *Tenderness Test:* Neurotic persons will not allow the examiner to use this test, but when their attention is distracted, pressure will not increase the pain. A fairly reliable sign in psychic pain is the fact that superficial contacts, like combing the hair, are very

painful, while deeper pressure may cause no discomfort. Organic pain is increased in intensity when sufficient pressure is used to send stimuli to the optic thalamus.

3. The pulse rate and blood pressure are increased in organic pain, when the painful area is pressed, but not in psychic pain.

4. *Pain Reflex:* It consists of an involuntary pulling away of the painful part when touched. It is present in organic pain, but not in psychic pain. In the neurotic there is a voluntary movement of the affected part, which may confuse the examiner.

5. *Facial Expression:* In organic pain there is a narrowing of the palpebral fissure, especially at the outer canthus. This is due to stimulation of the optic thalamus, and is therefore not present in psychic pain.

6. *Pupillary Reflex:* In organic pain there is a dilatation of the pupils, which is probably also of thalamic origin. It is absent in psychic pain.

7. *Effect of pain on sleep:* Psychic pain does not interfere with sleep. Organic pain does.

THE EAR.

Before describing the mechanism of the pain due to diseases of the ear, it is well to review its sensory innervation.

Sensory Innervation of the Ear. External ear: The external ear is characterized by a very complex and intricate sensory innervation. The anterior half of the auricle and the superior and anterior walls of the external auditory canal are supplied by the auriculo temporal branch of the third division of the fifth nerve. The posterior surface of the auricle receives its sensory innervation through the auricular branches of the great auricular and the small occipital nerves from the second and third cervical ganglia. The inferior and posterior walls of the external auditory meatus are supplied with sensation by the auricular branch of the vagus nerve (Arnold's nerve).

The ganglionic representation of sensation on the auricle and the external auditory canal can be divided between the Gasserian ganglion in front, the second and third cervical ganglia behind, and the jugular ganglion of the vagus nerve in between. The areas supplied by the Gasserian and the second and third cervical ganglia have been studied in patients after resection of the respective ganglia for the relief of neuralgia by determining the resulting anesthesia. There remains a region which retains its sensation after extirpation of the Gasserian and the second and the third cervical ganglia. This region, according to Ramsay Hunt, is supplied not only by Arnold's nerve, but also by sensory branches of the facial nerve, having their

origin in the geniculate ganglion, which is a sensory ganglion. Hunt in his numerous writings[4] presents many convincing arguments in favor of such a nerve supply. Anatomists, however, have not accepted his views. They regard the facial as a pure motor nerve, with the exception of the large superficial petrosal and the chorda tympani nerves, which are its only sensory branches, but have no cutaneous representation. The difficulty is still more increased by a considerable overlapping of all sensory nerves in this region.

Membrana Tympani. The tympanic membrane is one of the most sensitive structures of the body. According to Wilson[1] the nerve fibres end free between its epithelial cells. There are no other sense organs present in this membrane. The free nerve endings, therefore, are regarded as the specific pain sense organs.

The anterior portion of this membrane is supplied by the auriculotemporal nerve and the posterior portion by Arnold's nerve. Hunt[4] believes that it is also innervated by a sensory branch of the facial nerve. The inner surface of the tympanic membrane receives its sensory supply also from the tympanic nerve, a branch of the ninth cranial nerve.

Middle Ear. The middle ear is supplied by the tympanic plexus. This plexus is formed by (1) the tympanic branch of the ninth nerve (sensory somatic fibres), (2) the small deep petrosal nerve of the carotid plexus (vasomotor autonomic fibres), (3) the small superficial petrosal nerve (containing probably afferent autonomic fibres), (4) a branch from the geniculate ganglion. It is possible that the latter branch may convey sensory fibres from the geniculate ganglion of the facial nerve to the ear.

Mastoid. The skin covering the mastoid region is supplied by the mastoid branches of the great auricular and the small occipital nerves. The mastoid cells receive their innervation by a mastoid branch of the tympanic nerve of the ninth cranial nerve.

EARACHE CAUSED BY DISEASES OF THE EAR (SOMATIC PAIN).

Perichondritis and Frostbite. Perichondritis and frostbite are the most important diseases of the auricle that produce severe pain. This pain is due to involvement of the nerve endings or nerve fibres of the auricular branches of the auriculotemporal, the great auricular and small occipital nerves, depending upon the location and extent of the lesion.

Furunculosis. Furunculosis of the external auditory meatus causes extreme pain. It is due to inflammation of the soft parts of this canal, causing irritation of the nerve endings and nerve fibres of the auriculotemporal nerve, and probably also of Arnold's nerve.

The pain is most severe when the auriculotemporal nerve is involved. The auricle is very sensitive to the slightest touch. The pain is increased by mastication, as the temporo-mandibular joint is also supplied by the auriculotemporal nerve. The inflammatory process often extends to the mastoid region, involving the mastoid branches of the great auricular and the small occipital nerves, so that a furunculosis of the external auditory meatus may simulate an acute mastoiditis.

Acute Otitis Media. In acute otitis media the pain is steady and boring in character. Its greatest intensity is within the ear. It is due to involvement of the tympanic and the auriculotemporal nerves. On account of irritation of the latter nerve the pain may also be located in front of the ear. It is relieved only by spontaneous rupture of the drum or by incision. If the pain is continuous after the opening of the drum, we must think of a possible mastoiditis.

Acute Mastoiditis. In acute mastoiditis there is usually a periostitis and an acute bone congestion with severe pain over the mastoid. The pain is first deep seated and boring, due to involvement of the mastoid branch of the tympanic nerve. It soon becomes more superficial and diffuse over the head and neck, due to irritation of the mastoid branches of the great auricular and the small occipital nerves. On account of the associated otitis media there is also an involvement of the auriculotemporal nerve, The pain, therefore, occupies an area of practically the whole side of the head. Later on it may become more or less localized as the abscess cavity forms.

Vacuum Earache. Vacuum earache is caused by enlarged tonsils and adenoids. These may obstruct the eustachian tube and so bring about a negative pressure in the middle ear and a retracted drum. This type of pain is practically confined to infants and children, and appears mostly at night. The child awakes with an earache and starts to cry. The act of crying opens the eustachian tube, the drum assumes its normal position and the pain ceases.

Autonomic Pain. The small superficial petrosal nerve, which participates in the formation of the tympanic plexus, may be regarded, like the large superficial petrosal nerve,[5] as a white communicating ramus. We may, therefore, assume that it also contains afferent autonomic fibres. If such fibres are present, they probably run their course through some of the sensory branches of the third division of the fifth cranial nerve, through the otic ganglion (which is a para-sympathetic ganglion), to the small superficial petrosal nerve. They then possibly come into relation with the sensory cells of either the petrous ganglion of the ninth nerve or of the genicu-

late ganglion of the seventh nerve. The petrous ganglion, we know, gives off sensory fibres to the ear, and, according to Hunt, the geniculate ganglion takes also part in its sensory innervation. We can, therefore, understand how an irritation of the afferent autonomic fibres in any part of their course may produce pain that is referred to the ear. This type of earache, without disease of the ear proper, is called otalgia.

Otalgia. In order to understand the mechanism and to interpret the significance of otalgia, it is not only necessary to know the nerve supply of the ear, but also to what other organs the same or very closely related nerves are distributed.

To facilitate the study of the subject matter let us classify the otalgias into the following types: (1) Referred or autonomic otalgia; (2) reflex otalgia; (3) herpetic otalgia; (4) tabetic otalgia; (5) primary or idiopathic otalgia; (6) psychic otalgia.

Referred or Autonomic Otalgia. The presence of autonomic otalgia will depend upon the circumstance whether or not there are afferent autonomic fibres within the nose, nasopharynx and buccal cavity. There is clinical evidence that this may be the case. We know that in posterior ethmoiditis and in sphenoiditis the pain may be referred to the mastoid region, probably along the large superficial petrosal nerve to the second and third cervical ganglia, which supply sensory nerves to this region. Dr. Sluder was one of the first to call our attention to this fact. The pain may also be felt in the depth of the ear, due to the probability that some of the afferent autonomic fibres within the large superficial petrosal nerve have their cell bodies in the geniculate ganglion, which, we know, gives off a sensory branch to the middle ear.

Lesions in the buccal cavity may refer the pain along the small superficial petrosal nerve to the geniculate or to the petrous ganglion, as stated under the heading of "Autonomic Pain." (See diagram.)

Reflex Otalgia. Reflex otalgia is a somatic pain. It is due to involvement of those sensory nerves of the ear, which are irritated in regions far away from this organ.

Deep ulcerations on the side of the tongue (anterior two-thirds), caries of the lower teeth, inflammatory conditions of the salivary glands, disease of the temporo-mandibular joint, may cause pain which is reflected along the auricular branch of the auriculotemporal nerve. The latter nerve does not only supply the ear with sensation, but also the temporo-mandibular articulation and the parotid gland. Besides it is closely related to the lingual nerve, which innervates the anterior two-thirds of the tongue, the submaxillary and lingual

salivary glands, and to the inferior dental nerve, which supplies the lower teeth. The location of the pain will be in the ear, in the external auditory meatus, and with the greatest intensity just in front of the ear.

Ulcerations of the pharynx, the palate, the posterior one-third of the tongue, tonsillitis, peritonsillar abscess, cause pain within the ear, due to irritations of the ninth nerve, which also supplies the middle ear.

Ulcerations and diseases of the pyriform fossa, of the arytenoids may cause reflex otalgia, due to irritations of the sensory fibres of the vagus nerve. It may also be produced by glandular enlargement implicating the great auricular and small occipital nerves, which would cause the pain to be situated behind the ear.

Tumors of the neck, including goiter, may also cause reflex otalgia behind the ear by the involvement of the great auricular and small occipital nerves, and caries of the cervical vertebrae may produce it by irritating the roots of these nerves.

Herpetic Otalgia (Herpes Zoster Oticus). Herpetic otalgia may be caused by an inflammatory process in any of the six sensory ganglia that supply the ear with sensation, namely, the Gasserian, the second and third cervical ganglia, the jugular ganglion of the vagus nerve, the petrous ganglion of the ninth nerve, and the geniculate ganglion. According to Hunt, herpes oticus, causing pre- and postherpetic otalgia, is due to an involvement of the geniculate ganglion alone. Mills[6] does not agree with him, but attributes the eruption and the pain in such cases to disease of the Gasserian, the second and third cervical ganglia, or possibly to the glossopharyngeal and vagal ganglia. An important consideration in favor of Hunt's view is the fact that in practically all reported cases of herpetic otalgia there was an associated facial palsy, but an absence of herpes of the mucous membrane in the intra-oral distribution of the ninth and tenth nerves and also freedom from pharyngeal and laryngeal palsies.

Tabetic Otalgia. Hunt[7] describes a case of tabes with lancinating pains in the ear. A degeneration of the nerve of Wrisberg was found.

Idiopathic Otalgia. Idiopathic otalgia has been described by many observers and is attributed to neuralgia of the third division of the fifth or of the great auricular and occipital nerves, depending upon the position of the pain. Hunt believes, however, that there exists an idopathic, primary otalgia of the sensory portion of the facial nerve. He refers to such a case[8] that was cured by intra-

cranial section of the nerve of Wrisberg, which may be regarded as the posterior root of the sensory facial nerve. The pain was very severe, lancinating, neuralgic in character, paroxysmal, localized chiefly in the ear, the anterior wall of the external auditory meatus, and just in front of the ear. Immediate relief was obtained after section of the nerve of Wrisberg. This is similar to the relief that is obtained in trigeminal neuralgia after section of its sensory root.

Psychic Otalgia. Psychic otalgia is a pain which originates in the cerebrum of a neurotic person, and for some reason is referred to the ear, particularly to the mastoid region. The diagnosis is made by considering the mental condition of the patient and the differential points stated at the beginning of this paper.

Location of the Pain in Otalgia. In intelligent patients it is usually possible to get a more or less accurate information in regard to the site of the otalgia. Roughly stated, the greatest intensity of the pain may be either in front of the ear, within the ear, or in the region back of the ear. Using the accompanying diagram, it will often be possible to find out the probable cause of the otalgia by the position of the pain.

The largest number of cases of otalgia, seen by me, were due to caries of the lower teeth. These patients complain of a moderate pain in the ear. They are liable to get paroxysms of severe pain, during which time the greatest intensity of the pain is in front of the ear. I have seen several cases of carcinoma of the tongue, where the greatest intensity of the pain was just in front of the ear. A patient with a luetic deep ulceration on the side of the posterior one-third of the tongue complained of pain in the depth of the ear, and not in front of the ear. A patient with a calcalus in Wharton's duct complained of pain in front of the ear. This pain could be elicited by pressure on the calculus with the fingers. The calculus was removed by me at the Manhattan Eye, Ear and Throat Hospital. The otalgia disappeared. Another patient came to the Lenox Hill Hospital Dispensary complaining of pain in the right ear. A new growth in the right half of the larynx was found, which on microscopic examination proved to be a carcinoma. Other interesting cases must be omitted on account of the limitations of this paper.

Pain in Jugular Thrombosis. Jugular thrombosis may at times be accompanied by trigeminal neuralgia and it is very difficult to account for this occurrence. It is possibly due to an irritation of Arnold's nerve, which arises from the sensory ganglion of the vagus nerve and passes behind the jugular vein.

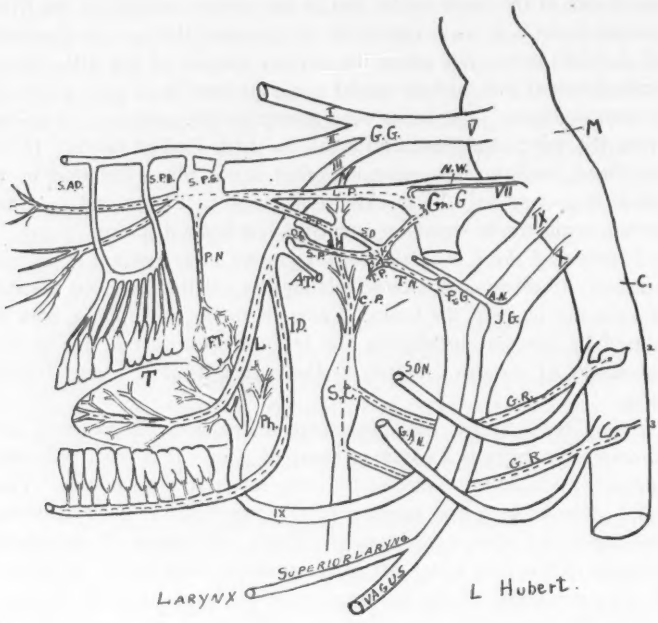
It has been shown that Arnold's nerve terminates in the medulla, not in one of the vagal nuclei, but in the sensory nucleus of the fifth cranial nerve. It may, therefore, be assumed that an involvement of Arnold's nerve may affect the sensory nucleus of the fifth nerve. Stimulation of this nucleus would cause an impulse of pain to travel to the cerebrum. The latter then interprets the pain as if it arises from the peripheral distribution of the fifth cranial nerve. It is, therefore, important to remember that nerve fibres irritated by a diseased process may be in close association in the central nervous system with nerves supplying structures at some distance.

Relation of the Ear to the Meninges and the Brain. It is not necessary to dilate on the close relationship existing between the ear and the meninges of the brain. Suffice it to say that intense pain is caused by otogenic meningitis and brain abscess. It is due to involvement of the dura matter, as the cortex itself is insensitive to pain.

Pain Caused by Increased Intracranial Pressure. Increase of intracranial pressure is a common cause of pain. It is most probably due to tension and pressure of the very sensitive dura matter. The relief afforded by a free opening of this membrane is good evidence that this is the correct explanation. There are certain characteristic features of this pain which are of the greatest value in the diagnosis. In the early stages of the disease it is generally paroxysmal in character. The paroxysms are often brought about by any unusual form of mental or physical exertion. Sudden changes of posture, such as stooping, also coughing, sneezing, may precipitate a paroxysm of pain. In the later stages of the disease the pain becomes more or less constant. But even in the latter cases it will often be found that paroxysms of pain occur, and then the pain is greatly increased in intensity. Such exacerbations are usually accompanied by other symptoms of increased intracranial pressure, like nausea or vomiting and certain changes in the eye grounds.

The location of the pain due to increased intracranial pressure is variable. If the lesion is a localized one, *e. g.*, a cerebral or cerebellar abscess, the pain may in the early stages have a close relation to the position of the lesion. Often, however, this localization is lacking. When the pain has persisted for a long time and occurs in paroxysms, patients say that the whole head aches intolerably and feels like bursting.

In certain intracranial growths the pain may be due not only to increased intracranial pressure, but also to involvement of the Gasserian ganglion or the sensory root of the fifth cranial nerve.[9]



Diagrammatic Interpretation of Otalgia: M, medulla; C, cervical cord; S. O. N., small occipital nerve; G. A. N., great auricular nerve; V, fifth cranial nerve; VII, facial nerve; IX, glossopharyngeal nerve; X, vagus nerve; N. W., nerve of Wrisberg; G. G., Gasserian ganglion; Gn. G., geniculate ganglion; P. G., petrous ganglion; J. G., jugular ganglion; S. C., superior-cervical ganglion; S. P. G., sphenopalatine ganglion; O. G., otic ganglion; L. P., large superficial petrosal nerve; D. P., large deep petrosal nerve; S. P., small superficial petrosal; S. D., small deep petrosal; T. N., tympanic nerve; T. P., tympanic plexus; A. N., Arnold's nerve; L, lingual nerve; I. D., inferior dental nerve; S. A. D., superior anterior dental; S. P. D., superior posterior dental nerve; P. N., palatine nerve; T. tongue; F. T., faucial tonsil; A. T., auriculo-temporal nerve; C. P. carotid plexus; G. R., gray ramus; Ph., pharyngeal nerves; — — — — —(dashes)=afferent outonomic fibres.

Cause of Otalgia in Front of Ear: (1) Lower teeth; (2) anterior two-thirds of the tongue. (3) temporo-mandibular joint; (4) salivary glands.

Cause of Otalgia within the Ear: (1) Pharynx; (2) palate; (3) tonsils; (4) posterior one-third of the tongue; (5) pyriform fossa and arythenoids; (6) buccal cavity.

Cause of Otalgia in Back of the Ear: (1) Ethmoiditis and sphenoiditis; (2) glands of the neck; (3) tumors of the neck (goiter); (4) caries of cervical vertebrae.

Among such tumors, those of the cerebello-pontine angle are of interest to the otologist.

Central Pain. Local diseases of the brain, which are not producing an increased intracranial pressure, do not cause any pain. However, lesions involving the posterior part of the optic thalamus, containing the pain center, are known to cause severe "central" pain, which is usually referred to the extremities, but may also be projected to the head.

The pain of thalamic origin is very characteristic. It comes on in paroxysms; it is of great severity and persistency. It is often intolerable and does not yield to any analgesic treatment. It appears in some part or parts of one half of the body and face. It is associated on the same side with a mild hemiphlegia, a marked hemianesthesia of deep sensibility, a less marked hemianesthesia of superficial sensibility, tactual pain and temperature.

Another characteristic in thalamic lesions is an excessive response to affective stimuli on the involved side, *i. e.*, although the threshold for painful stimuli is raised, the pain, once appreciated, produces more discomfort on the involved side; but in order that this appreciation may occur, the stimulus must be more intense than on the normal side.

SUMMARY.

There are three general types of pain: (1) Somatic, (2) autonomic, (3) psychic.

In the somatic type, the pain is due to irritation of the pain sense organs or the pain nerve fibres of the ear. It may also be due to irritation of the same nerves or closely related nerves that are distributed to structures at some distance from the ear (otalgia). In the latter instance, there is no disease of the ear proper, but only pain, which is felt, either in front, within, or in back of the ear. It may be present just in front and within the ear, within the ear alone, or within the ear and over the mastoid region. In intelligent patients it is often possible to diagnose the cause of the otalgia by the location of the pain.

Somatic pain may also be due to involvement of any of the six sensory ganglia that supply the ear with sensation. This may manifest itself in a specific infection of these ganglia, resulting in herpes zoster.

Idiopathic neuralgia of the sensory nerves to the ear, similar to trifacial neuralgia or *tic douloureux*, may occur. Involvement of the posterior roots of these nerves may also cause severe pain in or around the ear.

Pressure on the dura matter, which, with one exception, is the only sensitive part of the brain, causes more or less characteristic pain. This pressure, from the otological standpoint, may be caused by otogenic meningitis, temporo-sphenoidal and cerebellar abscesses and tumors of the cerebello-pontine angle. All diseases of the brain, which do not produce any pressure on the dura, do not cause any pain. The one exception is the posterior part of the optic thalamus, which contains the pain center. Irritation of this part produces a typical thalamic syndrone with characteristic pain.

The presence of autonomic pain in or around the ear has not yet been definitely proven. Its existence will depend upon the circumstance whether or not afferent autonomic fibres are present in the nose, nasopharynx, and buccal cavity.

Psychic pain has its origin in the cerebrum, and, for one reason or another, is referred to the ear, especially to the mastoid region.

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161 East 79th Street.

REPORT OF A CASE OF CARCINOMA OF THE LARYNX LARYNGO-FISSURE.*

Dr. Herbert S. Birkett, Montreal, Canada.

A. M. S., male, aged fifty-eight years; occupation, train dispatcher. This patient was kindly referred to me on September 23, 1919, by Dr. V. A. Hart of Barrie, Ontario, on account of hoarseness which had resisted the usual remedies for supposed cold in the throat.

The patient stated that the voice had been husky off and on for one year before I saw him and that the hoarseness had been permanent for the past four months.

Examination of the larynx revealed an ulceration of the right vocal cord on its superior surface, extending from the anterior commissure backwards to about 2 mm. from its insertion to the vocal process. In outline it was somewhat oval, the inner edge of which extended downwards involving the subglottic area for 3 mm. The surface of the ulceration was covered in its entirety with a whitish, yellow-looking slough. The left false cord, which was swollen but not infiltrated, hid the whole third of the true vocal cord from view. The colour of the mucous membrane of the larynx was slightly darker than normal. The movements of the right vocal cord were not as active as those of the left. Fig. i.

Personal History: No previous illness and no history of lues.

Physical Examination: Absence of any disease of the thoracic or the abdominal viscera. The roots of several teeth were found very defective and the gums surrounding them unhealthy. All the defective teeth were removed and the mouth was brought into a more healthy condition pending operative interference on the larynx.

October 3rd the patient was admitted to the Royal Victoria Hospital. The following day, under local anesthesia, the larynx was examined by the direct method, whereby it was possible to obtain a better view of the full extent of the ulceration of the right vocal cord anteriorly than by the indirect method. The ulceration was found to extend 1 mm. beyond the middle line.

A portion of the growth was removed for microscopic examination with the distinct understanding with the patient that, should it prove to be malignant, operative interference would be consented to.

*Read at the Forty-fourth Annual Meeting of the American Laryngological Association.

Accepted for publication, Jan. 27, 1923.

The pathological report proved it to be a squamous-cell carcinoma. November 2nd the operation of laryngo-fissure was undertaken under chloroform anesthesia, the patient having had a hypodermic injection of ⅛ gr. morphin and 1/150 gr. atrophin three-quarters of an hour before the operation.

A low tracheotomy was done without previous local infiltration anesthesia. A very broad isthmus of the thyroid gland was found occupying the field of operation; this was ligated on either side of the midiline and then cut through. Before opening the trachea 10 minims of a 5 per cent solution of cocain were injected into the trachea, as suggested by St. Clair Thomson, which absolutely abolished any reflex cough upon the introduction of the tracheotomy tube. The division of the alae of the thyroid cartilage was carried out by a fine saw, beginning 2 mm. to the left of the middle line, and upon completing the exposure of the interior of the larynx it was found that the line was beyond any apparently invaded tissue.

The method of removal of the entire vocal cord, with the underlying perichondrium and arytenoid cartilage and the subsequent steps of the operation, were carried out as detailed by St. Clair Thomson and Irwin Moore. There was practically no troublesome hemorrhage following the removal of these structures. The alae were next accurately apposed and maintained in this position by the drawing together of the separated muscles by deep sutures of catgut. The skin incision was closed above by sutures as far down as the level of the tracheotomy tube; below this it was left open.

The patient was returned to bed in good condition and until recovery from the anesthetic lay on his right side with the head level. When recovery was complete the patient was placed in a semi-recumbent position and for twenty-four hours was given only sterilized water by the mouth.

Twenty-four hours after the operation, as no reactionary oedema was found upon laryngoscopic examination, the tracheotomy tube was removed. As no difficulty was experienced by the patient in swallowing, he was allowed a gradually increasing generous diet, and upon the fourth day after the operation was permitted to sit up in a chair, leaving the hospital seventeen days after the operation.

Three weeks later it was noted that quite a mass of granulation tissue had made its appearance on the site of the removed right vocal cord, which was so large as to slightly obstruct his breathing. A 50 per cent solution of argyrol was applied daily, with the result that the granulation gradually lessened and in six months had quite disappeared, having resolved itself into a smooth, white band of

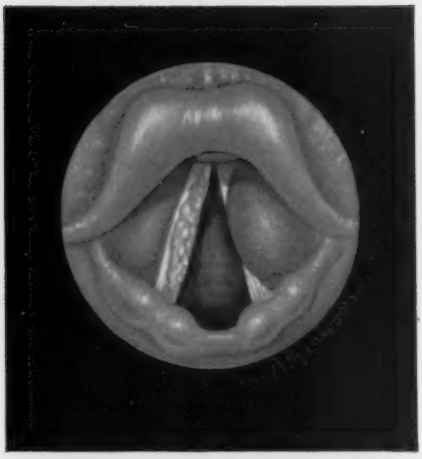


Figure I

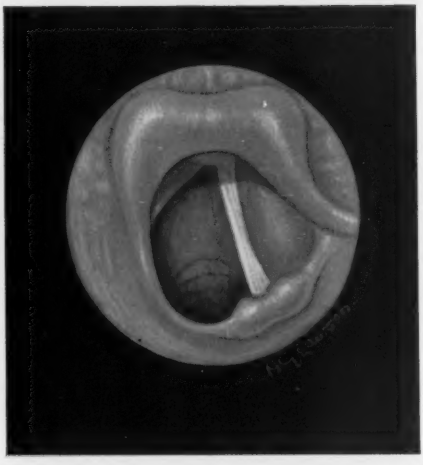


Figure II

Dr. Herbert S. Birkett

cicatricial tissue, resembling to a slight degree a vocal cord, the so-called "cicatrix vocal cord" of Burger. Fig. ii.

It is now two and a half years since the operation, and the patient has gained in weight and his voice has become so much stronger that it can be distinctly heard at a distance of fifteen feet in a quiet room and he is able to carry on his work as train dispatcher, his voice being heard distinctly at a distance of 160 miles through the telephone.

Pathological Report: The following is the complete pathological report of the specimen removed:

Right vocal cord and surrounding mucous membrane. An irregular mass of brownish tissue, somewhat triangular in shape. One surface is covered by a mucous membrane, while the other consists of a friable brownish and blackish, shaggy tissue raised up into a cauliflower-like arrangement. Running along one free border is a wedge-shaped piece of whitish cartilage, some 2 cm. long by 8 cm. thick. The mucous membrane in its lower extent shows upon section a narrow bundle of whitish soft tissue, lying in it and just below and running up the specimen parallel to the cartilage. In its upper extent the mucous membrane is involved in an extension from the raised growth from the other surface; it is discolored, raised and ulcerated. Upon section of the lower surface the process is seen to be superficial and has not penetrated the deeper tissues, for these seem to be quite intact.

Microscopic Examination. The section shows large islands of actively proliferating squamous epithelial tumor cells, which in this section are not actually invading the structure lying beneath them. In type, however, they are young and supple. The mucous membrane covering the muscle lying below is swollen and pale, and in places necrotic, while the submucosa is densely infiltrated with acute and chronic inflammatory cells.

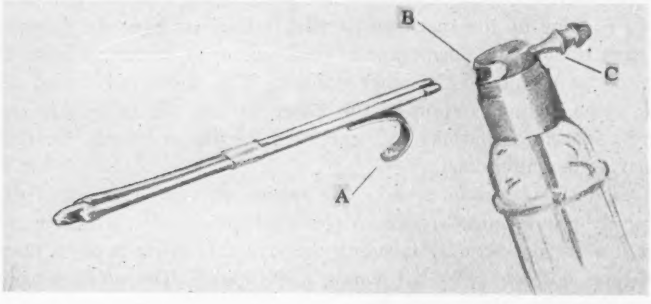
Diagnosis. Squamous-cell carcinoma with secondary infection.

A MODIFIED ATOMIZER-TIP FOR SPECIALISTS.

Dr. Arthur W. Proetz, St. Louis.

The sterilization of atomizer-tips has been more or less a problem, or at least a nuisance to the specialist. The removal of the tip for boiling required a certain amount of tedious manipulation; and if several sprays were used in the course of a treatment the transfer of the tubes from one bottle to another contaminated the various solutions. Oil droplets appeared in the cocain solutions and vice versa. To avoid this a whole battery of tubes—one to a bottle—was required for each patient.

Attempts have been made to overcome these inconveniences by using detachable tubes, but the forms now on the market require accurate adjustment of the tubes in relation to the axis of the bottle, and have troublesome thumb-screws which obstruct the line of vision over the top of the bottle. It is often difficult to remove these tips from their sockets owing to their accurate fitting.



To obviate these annoyance I have devised the detachable tip depicted herewith. The arrangement differs from the ordinary atomizer only in that the parts are separable as shown, and there is a flat finger-hook (A) soldered to the lower surfaces of the tubes. This hook serves a three-fold purpose: first, it holds the tubes the correct distance apart so that they exactly meet their respective openings in the bottle-head; second it keeps the parts in firm contact, prevents their coming apart while in use, and renders an accurate fit unnecessary; third, it indicates at a glance the up-and-down of the tip, facilitating its insertion right-side up.

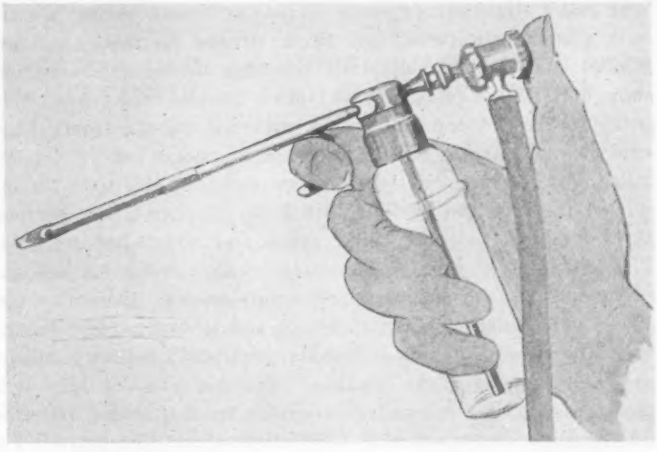
Accepted for publication, May 20, 1922.

A strip of metal with a single wide opening may be soldered over the two openings in the head as shown in the illustration (B) to lend support and assist in quickly adapting the tip to its position. This band is not essential. It is important, however, that there should be no air-leak from the nipple (C) into the bottle as it traverses the metal head. The tube-ends may be tapered slightly to improve the fit.

Only one tip is required for each patient, passing from one bottle to another and is then sterilized by boiling.

This device has the following advantages over other arrangements I have seen:

Simplicity and speed of adjustment.



No thumb-screws to obstruct the view or to fall on the floor.

No contamination of spray solutions, as the vertical tubes remain in the bottle.

Wear and tear has no effect upon operation as a perfect fit is not required.

No liquid is spilled in case of a leak, as the tube conducting it is under negative pressure.

Economy of movable or adjustable parts.

Its use is limited, of course, to specialists who have compressed air at their command, and is not intended for home use. The device is not patented and I hope it may give service to the profession. It has proven satisfactory in my office over a period of six months.

University Club Building.

CASE OF MAXILLARY SINUSITIS IN A CHILD, WITH A FATAL ISSUE.

DR. J. A. MORGAN, Honolulu, T. H.

M. White Male, Age, 8. Child had always been healthy and vigorous and had had none of the diseases of childhood. Since the age of three he had been in the habit of diving and swimming in both salt and fresh water. Lately his swimming has been confined to fresh water tanks and to contaminated inland streams. One morning he awoke with a severe frontal headache and a slight temperature. The day before he had a swim in a particularly turbid mountain stream following a heavy rainfall. The parents did not consider the condition serious enough to call a physician and gave him several doses of aspirin. As the elevated temperature continued and the frontal headache did not subside, after three days a general practitioner was called, and the case referred to the writer. At this time the left side of the face and eyelids were badly swollen. The temperature was 103 and the pulse rapid and somewhat irregular. The left nasal passage was occluded with a badly swollen and edematous inferior turbinate. A small amount of cocaine was placed beneath the inferior turbinate and an antrum needle very carefully introduced. Considerable thick and cranberry colored pus was withdrawn by suction. Cultures showed hemolytic streptococci. There was free drainage from the affected sinus subsequently and no further manipulation was necessary. The swelling in the face and about the eye subsided in twenty-four hours but the temperature continued to rise and on the following day the left ankle and right shoulder became involved in an arthritis. These joints became swollen, edematous and extremely painful and at the same time the temperature rose to 105 and the pulse became very rapid and irregular. On the following day the right ankle and both elbow joints became swollen and delerium set in. The heart was watched very carefully and the increase of the area of dullness was very rapid until the end. The cardiac condition became steadily worse and the child expired at the end of one week from the time the earliest symptoms appeared.

Accepted for publication, Dec. 30, 1922.

It is the opinion of the physicians attending this case that the infection entered the general circulation at the very beginning and that the sinus involvement was of secondary importance. A number of similar cases have been observed in both children and adults following high diving and swimming under water and it seems to be particularly dangerous for young children whose nasal sinuses have not reached the stage of mature development. Also these cases have occurred more frequently during periods when influenza is prevalent.

Room 48 Alexander Young Bldg.

REPORT OF CASE OF CHRONIC MASTOIDITIS WITH EXTENSIVE PATHOLOGY. OPERATION. RECOVERY.

DR. FRANCIS M. SHOOK, Oakland, California.

Patient, housewife, age 26. Family history, nothing special. Personal history, good health for many years. No serious illness. Has had discharging right ear since childhood. Origin unknown. This condition has been treated at various times with no result. No operative procedure has been advised. The purulent discharge would sometimes cease for considerable periods.

Present Illness. Daily afternoon rises of temperature from 100° F. to 102° F. This began six weeks ago and was accompanied by moderate general malaise. No pain. After two weeks the temperature showed a definitely septic type. Her family physician advised consultation with an otologist, but this was refused. Two weeks later a tumor appeared in the right anterior cervical region. This tumor presented the characteristics of an inflammatory cervical adenitis. The septic type of temperature continued and the patient's condition altered decidedly for the worse. Six weeks after the onset, the writer was called in consultation.

Status Praesens. Patient, young woman. Well nourished, but showing evidences of considerable loss of weight. Temperature 104°. Leucocyte count 30,000. Tumor right cervical region size of small orange. Right ear, purulent discharge through large opening in drum. No pulsation. Slight pain on pressure over the mastoid.

Accepted for publication, Nov. 26, 1922.

Operative findings. Infected cholesteatoma covered by eburnated bone. Radical mastoid operation. The lateral sinus lay far forward and was in contact with the infected cholesteatoma. Sinus wall gray. On opening the sinus a septic thrombus partially organized was found. The sinus was uncovered and opened almost to the torcular. No bleeding occurred. About three inches from the auditory canal a brain abscess containing several fluid drachms of pus was found. This was opened and drained. The mastoid incision was continued along the anterior border of the sterno mastoid muscle, and deep dissection made to the jugular vein. The tumor mass proved to be an abscess cavity containing several ounces of pus. The jugular vein was filled with pus and partially organized clot. The contents of the vein were evacuated and the vein followed almost to the clavicle. No bleeding occurred. No attempt was made to cut a plastic flap for the radical mastoid. The entire wound was left open. Several rubber drains were inserted into the brain abscess, the cervical abscess and the radical mastoid cavities.

Post-operative course. For several weeks the patient's general condition was rather bad, but not alarming. The temperature became progressively lower and finally subsided almost to normal. Several months later, under a general anesthetic, the mastoid wound was cleaned up and a plastic flap cut. At the present time (two years subsequent to the operation), the radical mastoid cavity is in good condition, although not dry. There is a brain hernia about the size of a hen's egg at the site of the brain abscess. The patient's general condition is good with the exception of headaches occurring at intervals of one to three months. When these headaches occur, the brain hernia increases in size and the overlying tissues break down, followed by a discharge of cerebro-spinal fluid. The headaches disappear as soon as the cerebro-spinal fluid discharges.

Conclusions. In the writer's opinion, this case is another illustration of the danger of allowing chronic discharging ears to remain without surgical attention. A radical mastoid operation would have made this condition a safe one if performed at an earlier period. This case also illustrates again that there may be very dangerous mastoid pathology in chronic discharging ears without middle ear signs. This patient had received the usual specialist's non-surgical treatment, consisting of repeated office visits, where various local applications had been made. At no time had advice been given as to the possible danger complications which might occur unless surgical care were given, or the absolute futility of treatment by local application of a deep-seated osteomyelitis in a location potentially so dangerous.

Medical Building.

CEREBRO-SPINAL RHINORRHEA WITH REPORT OF A CASE.*

DR. JOHN EDWARD LOFTUS, Philadelphia.

Cerebro-spinal rhinorrhea is a rare affection, characterized by the escape of cerebro-spinal fluid into the nose. In 1834 King[1] published a paper, which in all probability was the first case of cerebro-spinal rhinorrhea reported. His patient, a woman 52 years old, who discharged one quart of clear limpid fluid from her left nostril in every twenty-four hours. The true nature of this fluid was not appreciated until many years after. Tillaux[2] in 1877 reported the first definite case in which the fluid was examined with special reference to its source and its connection with the cerebro-spinal tract.

A reference to Landois and Stirling's "Text-book of Human Physiology," published in 1885, shows how little was known at that date of the cerebro-spinal fluid, the only notice of it being a quotation from Hoppe-Seyler. Indeed it is remarkable that, until the work of Halliburton[3], little has been added to our knowledge of the fluid since 1842, when Magendie published his "Recherches sur le Liquide Cephalo-Rachidien," in order, as he writes, to place beyond doubt the normal existence of this fluid. Previous to that date, knowledge of the fluid in question had been very confused and unsatisfactory. Galen repeatedly speaks of an excrementitial liquid, expressed from several points of the brain into the ventricles, especially in the fourth, where it is stored, and then purged into the nose through the ethmoid bones and infundibulum. It is difficult to say if Galen's opinions were the result of direct observations, or if they were merely speculative.

After his period, Massa, Vesaluis, Vidus-Vidius and Varioli refer to the watery humour in the brain. In the sixteenth century we find Sansovino[4] still calling the nasal fossae the "Cloaca del cerebro." Schneider[5] finally showed how baseless was the fabric of the anatomical vision which saw any free communication between the nose and the ventricles of the brain.

It was not until the time of Willis[6] that the method of direct observation was brought to bear on the question as to what became of the cerebro-spinal fluid, a question which appears to have considerably puzzled the elder anatomist. Willis acknowledges that it is difficult to see how this fluid passes off through the holes in the

*Read before the Section on Otology and Laryngology of the College of Physicians of Philadelphia, December 20, 1922.

Accepted for publication, April 10, 1923.

cribiform plate, since they are completely blocked during life by the nerve fibre and the prolongations of the dura mater. Yet he holds that it is permissible to think that the fluid descends into the nose by openings which are invisiible after death, but dilatable during life, "by heat and the spirit." But Vieussens[7] points out that the pituitary membrane cannot be the excretory surface for the aqueous humours of the brain. He had opened many crania and found a quantity of water in individuals who had never during life voided anything similar by nose or mouth.

Cotugno[8] (1736-1822) who gave his name to the "Liquoris Cotunnii," calculates the amount in the cadaver at about four to five ounces; but although he had found the fluid in living fish and turtles, he is skeptical as to its existence in the living human subject. It is interesting to note that the works of Willis, Vieussens and Cotugno must have been strangely overlooked for it to be necessary for Magendie, so to speak, to rediscover this fluid. The fact is another confirmation of the saying that "nothing is new except what has been forgotten."

We are much indebted to St. Clare Thomson[9], who wrote an elaborate monograph on the subject in 1899. He reviewed the literature up to this time and analyzed nine undoubted cases, twelve most probable, and eight possible cases. Thomson's study is the most comprehensive report on cerebro-spinal rhinorrhea recorded in the literature. Since Thomson's report in 1899, there has been reported fourteen undoubted and two most probable cases, making a total of twenty-three undoubted, fourteen most probable, and eight possible cases reported in the literature up to the present time.

ETIOLOGY.

Nothing definite is known concerning the cause of cerebro-spinal rhinorrhea. Both sex are equally afflicted. The majority of the cases occur between the eighteenth and the sixty-fifth years, although the case reported by Fisher[10] was only 4 years of age, and the one by Collidge[11] 13 years. It has been suggested that it may be due to a tumor of the pituitary body. Leber[12] thought his case was due to hydrocephalus internus; others have mentioned intracranial tumor.

I am of the opinion that there may be a congenital defect remaining in the base of the skull, namely, the cranio-pharyngeal canal. This embryonic canal may be forced open, by anything that will cause increased pressure of the cerebro-spinal fluid, such as sneezing, coughing and laughing, thus causing a direct communication between the roof of the nose and the third ventricle, allowing the

escape of cerebro-spinal fluid. This may be made clearer in relating the embryology of the cerebral vesicles, pituitary and sphenoid bones.

In the hypothalmic region there is a recess behind the optic chiasma, indicating the outgrowth of this infundibular process of the pituitary body (hypophysis) and growing towards it an ingrowth of ectoderm from the embryonic mouth or stomodaeum. The roof plate is now beginning to be converted into a secretory structure, the choroid plexus of the third ventricle. The roof plate can be seen to extend from a slight dip or fold over the foramen of Monro to the region of the pineal body at the anterior border of the midbrain.

A sagittal section of the pituitary body of the fetus of the fifth month shows the neural part derived from the floor of the third venricle and the buccal derived from the ectoderm of the primative mouth. In the buccal part the central cavity divides the glandular mass into a part applied to the neural lobe into a paraneural or intermediate and a larger anterior part or lobe. Besides these two parts there is a third, the lateral or tuberal part, applied as a plate to the neck of the infundibulum.

As is so often the case in the development of the human body, embryonic processes which are abscure in man present themselves with almost diagrammatic sharpness in the lower vertebrae—particularly in selachians of which the dog-fish may be taken as a type. The original saccular form of the pituitary body and its division into three parts or lobes are well seen in the pup dog-fish. The lateral or tuberal parts arise as right and left diverticula near the root of the stalk. The tuberal part, as a distinct element of the pituitary complex, was first recognized by Dr. Tilney in 1913[18] but since then its presence has been noted in all vertebrates, including man. The lateral or tuberal parts as they expand become applied to the infundibular region of the floor of the third ventricle, their cells invading the arachnoid and occupying its meshes.

By the end of the fourth week the basis of the buccal part of the pituitary can be recognized in the roof of the primitive mouth or stomodeum just in front of the oral plate, which at this time closes the anterior end of the fore-gut. The stomodeum is lined with ectoderm, and it is therefore an ectodermal evagination, known as Rathke's pocket, which goes to form the buccal part of the pituitary. It will be noted that the ectodermal element is closely applied to the floor of the fore-brain from the start; in the fifth week the adjacent part of the neural floor begins to grow out and becomes the infund-

ibular process. One other point should be noted; just behind the upper attachment of the oral plate the entoderm of the fore-gut forms a slight pocket. Seessel found that in some animals (birds) this pocket also took part in the formation of the pituitary, and hence is called Seessel's pocket; it, however, does not share in the production of the human pituitary.

By the seventh week marked changes have occurred. The infundibular process (the neural part) is now quite evident; its cavity is still open, becoming filled in the ninth week. The buccal evagination has assumed a pocket form pressing against the neural process, its neck having become drawn out into a long stalk, because the base of the skull is being laid down between the roof of the pharynx and the floor of the fore-brain. The nasal and buccal cavities are being developed, the buccal end of the stalk coming ultimately to lie at the posterior border of the nasal septum. Usually some fragments of the pituitary stalk persist in the mucous membrane on the roof of the nasopharynx; cases occur in which, owing to a malformation of the base of the skull, the whole pituitary body of the sphenoid bone of the adult, the cranio-pharyngeal canal marks the site of the embryonic stalk.

Many theories have been formed to account for the position and formation of the pituitary in the floor of the third ventricle, a favorite one is that it has been formed round the opening or mouth of the central canal of the nervous system when that canal was alimentary in nature. It seems more probable, judging from recent observations of Cushing, that the pituitary is so placed because it discharges a secretion into the third ventricle which circulates in the cerebro-spinal canal as the homologue of the invertebrate alimentary canal, homologized the pituitary evangination of the buccal ectoderm with the invertebrate mouth and gullet and the pituitary body itself with the coxal glands of crustaceans.

The pituitary body is developed between the trabeculate cranii; the pre-sphenoid is formed in front of it and the basi-sphenoid behind it. A canal may remain in the foetal or even adult bone to mark the point of ingress of the buccal part of the pituitary[14]. The wings of the vomer cover the opening of the pituitary canal on the pharyngeal aspect of the skull, if it be present. On the cerebral aspect it opens at the olivary eminence which also marks the union of the pre and the basi-sphenoids.

The pre-sphenoid and afterwards the basi-sphenoid are much altered by the growth of the sphenoidal sinuses which commence to expand rapidly about the seventh year[15]. The great wings support

the temporal poles of the brain, their size depending on the development of that part of the brain. They are much larger in man than in any other mammal, owing to the great size of the human temporal lobes. The small wings project within the vallecula sylvii. In the early foetus the dorsum sellae is enormously developed, and fills the deep and sharp angle between the mid-brain and fore-brain.

From the foregoing consideration, it can be very readily seen why I draw the hypothesis that cerebro-spinal rhinorrhea is very likely the result of a persistent cranio-pharyngeal canal, which has been made patulous, by any act that would cause increased intracranial pressure.

Undoubtedly some cases are due to injury to the base of the skull while others may be due to syphilitic pachymeningitis.

PATHOLOGY.

Leber regarded his case as undoubtedly one of hydrocephalus intermus, in which the ossification of the skull lead to increased intracranial pressure. In other cases to which he was able to refer which were reported by Thomson at the date of Leber's publication (1883), he ascribes to a late hydrocephalus, although he allowed there was no direct evidence of this. Other factors which point toward hydrocephalus in contradistinction to tumor are the long duration of the illness in most cases and the constant absence of symptoms to one locality.

It is mentioned by Sir Thomas Watson[16] that hydrocephalus does occasionally commence long after the skull has become a complete case of bone. He quotes several cases and among others that of Dean Swift who is said to have died of this complaint in 1745, after an illness of three years duration. One of Priestly Smith's[17] cases greatly resembled the acute picture of serous meningitis passing into the chronic form.

There are only four cases of cerebro-spinal rhinorrhea reported in the literature in which a necropsy was performed. These cases were reported by Gutche[18], Mermod[19], Paget[20], and Baxter[21]. Gutche's case is of value in a negative way, as it shows the absence of localized disease. In Mermod and Paget's case the patient died from traumatic infection of the meninges which complicated the pathologic picture. The necropsy findings in Baxter's case were entirely negative.

It is interesting to note that the necropsy findings in these cases did not support the theory of Leber that cerebro-spinal rhinorrhea is due to hydrocephalus internus.

SYMPTOMS.

The symptoms of cerebro-spinal rhinorrhea are characterized by a persistent dripping of a clear watery fluid from the nose. The dripping may occasionally intermit and remain absent for one hour to several months or years, but usually it is continuous day and night. The dripping is altered or influenced by the position of the head; when the head is bent forward, it escapes more rapidly; when in the upright position, there is a minimum amount of dripping; when the head is inclined backward, or when lying in the dorsal decubitus, the liquid runs down the post-nasal space, thence into the throat and is swallowed; occasionally this sets up violent attacks of spasmodic coughing. The quantity of cerebro-spinal fluid is increased when the patient strains or when they exercise or become angered, nervous or excited.

When the patient is asleep in bed, with the head turned to the side, the fluid runs across the lip and onto the pillow; when the head is straight, face upright, the fluid is swallowed, causing a gurgling sound and choking sensations, which may disturb the sleep.

In the majority of the reported cases the flow was from the left side; in a few cases it alternated. In only one case reported the flow came from both sides. This however can be questioned since it was not accurately determined.

The flow in most instances commences gradually; occurs in drops, much as the flow of blood in epistaxis.

The fluid which escapes averages about one litre in twenty-four hours; it is clear and limpid as spring water, perfectly free from odor, tasteless, or slightly saltish. The escaped fluid does not stiffen the handkerchief after drying nor discolor it.

Associated with the flow there is frequently headache, which usually precedes the disease. It may be severe and generalized or mild. The headache is always more severe when the flow has diminished or during an intermission and is very much relieved when the flow is re-established. In the case herein reported the headache was constant, the severity however was much relieved when the flow was more profuse.

Cerebro-spinal rhinorrhea is commonly associated with eye symptoms which are those occurring with intracranial pressure. In the twenty-three cases reported these symptoms played an important role; they were more pronounced on the side of the nasal flow, and were much relieved after the establishment of thee flow. In the case described by Meyer[22], his patient was blind until cerebro-spinal fluid escaped from the nose. Optic neuritis occurred in

twenty cases and appeared as a slight visual disturbance to complete blindness, the field of vision is usually contracted peripherally, especially for colors, there may be reversal of color fields, the blind spot is enlarged, there may be hemianopsia or scotomata. There is no pain nor any external signs. Ophthalmoscopically, the disc is swollen, projecting, enlarged, of whitish and gray color with reddish center, and often presents white spots and hemorrhages; its situation is recognized only by convergence of the retinal blood vessels, its margin having become indistinguishable. The optic neuritis may progress into atrophy of the optic nerve, in which case there is a reduction in the acuteness of vision, concentric contraction or irregular or sector-shaped peripheral defects in the field, first for colors and then for form, diminution in the light sense, sometimes scotomata, and color blindness (first, for green; then, red; then, blue). These symptoms tend to progress and end in complete blindness. In these cases the disc is white, grayish or bluish white, its edges are sharply defined and regular, its size somewhat diminished and it presents a saucer-shaped excavation. Ordinarily there are no external signs. The pupils are usually dilated and react freely to light and accomodation. Central color perception was found normal in four cases. Five cases had bare light perception or total blindness. Prominence of the globe and insufficiency of the rectus internus was noted in one case. Korner[23].

Practically all cases showed evidence of some cerebral symptoms, although none of the cases were classical of any one disease; a few of the cases which Lebar had an opportunity to study pointed, in his opinion to a hydrocephalus internus. The changeable character in the symptoms, the absence of any well localized cerebral phenomena, the long duration of the disease, and the arrest of the nasal flow for long periods in several cases, or even complete disappearance, all point toward the hypothesis of hydrocephalus internus and away from any suspicion of cerebral tumor. The following were some of the symptoms manifested by the cases reported. Severe brain symptoms such as violent pains in the head, epileptic attacks, generalized convulsions lasting longer than an ordinary epileptic seizure, unconsciousness, vomiting never of the projective type, drousiness, delerium, somnolence, giddiness, facial paralysis, hemiplegias and extreme impairment of vision of both eyes to blindness owing to optic neuritis or post-neuritis optic atrophy.

DIAGNOSIS.

The constant and long continued escape from the nares, of a perfectly clear limpid fluid should always arouse a suspicion as to its

subarachnoidal origin. When the dripping is gradual in onset, and ordinarily preceded by head and eye symptoms; when the flow has always been unilateral, but occasionally may alternate; when it is continuous day and night; when it is augmented by exercise, coughing, vomiting, etc.; when its flow is altered or increased by the position of the head; when an analysis of the fluid shows that it is free from taste, smell and sediment; when albumen and globulin are found in very small quantities; when it is slightly alkaline in reaction; when the cell count is normal; when the specific gravity is low and there is present a substance which will reduce Fehling's solution; then the suspicion becomes a certainty.

Cerebro-spinal rhinorrhea is to be differentiated form the following diseases: Nasal hydrorrhea, dropsy of antrum or frontal sinuses, water inspired and retained in sinuses, vaso-motor neuritis and rupture of lymph tubes of the nose. The establishment of a diagnosis of cerebro-spinal rhinorrhea from the above named diseases lies in an examination of the suspected fluid.

PROGNOSIS.

In this disease the prognosis is unfavorable on account of the danger of a fatal termination from acute meningo-encephalitis. As soon as the diagnosis is established, or even if one is suspicious of the presence of this disease, all intransal treatment should be discounted for fear of carrying an infection to the meninges.

In the majority of the cases reported the outcome of the disease is not stated. The case reported by Gutche died about fifty-nine days after the first appearance of the illness, with the phenomena of cerebro-spinal meningitis. Some of the cases reported lived from fifty-nine days after the onset of the disease to twenty-nine years. There are two cases on record where there is an apparent cure. In Mackenzie's[24] case there was a cessation of flow for two years.

TREATMENT.

Unfortuately, there is nothing that can be done in the way of treatment. It is, not only useless but it is harmful to check the flow of fluid. In many of the cases reported, when the flow ceased spontaneously or was checked, the patient became worse. The administration of drugs by mouth and local applications intranasally have proved useless. The latter form of treatment is positively contraindicated; such practice may cause encephalitis. Lumbar puncture has been tried and has proven to be unsuccessful.

REPORT OF CASE.

History: A woman, aged 40, single, housework. Was first seen January 5, 1922, after she had been treated three months for sinusitis. She was complaining of a persistent dripping of clear fluid from the left nostril for the past three months. Family history is negative with the exception that obesity runs in the family. Patient has always been very stout; present weight, 241 pounds; otherwise past history negative. No history of any head injury.

Present condition started October 23, 1921. After a very hearty laughing attack, followed by severe sneezing, patient was aware of a clear limpid fluid from her left nostril; associated with this there was a severe frontal headache which extended to the vertex. The headache has been constantly present and diminishes somewhat when the flow increases. At the time of examination there was a continuous dripping of clear limip fluid from her left nostril. This was measured and the quantity for one hour was 1½ ounces. The fluid was clear, odorless, tasteless and without sediment, and slightly alkalin reaction. The flow has always come from the left nostril, with one exception, that when I firmly packed the left nares, it then came from the right side just as freely. At first the fluid would make her handkerchiefs stiff on drying but this only lasted during the first week of her present condition. At the present time there is no alteration in the color or consistency of her handkerchief; when it is dried it is very soft.

The flow of fluid is greatly altered or increased by the position of the head. When the head is dropped forward, there is a marked increase in the flow; when the head is in the upright position, dropping of the fluid is less; when the head is thrown backward the fluid runs down the post-nasal space into the throat and is swallowed; from the frequent elevation of her thyroid cartilage in the act of swallowing, it would lead one to believe that the flow is profuse; when lying in bed with her head hanging over the edge, face downward, there is a drop of fluid every two seconds. During sleeping hours the flow continues the same as in the day time, so much so, that it necessitates the patient to either lie on her face or to turn her face to one side. In the morning the pillow case is completely inundated, soft and stainless. The constant swallowing of this fluid at times has caused severe diarrhea. An unusual occurrence in this case—if such be correct, and I think it is, because of the patient's intelligence—is that, on three occasions she states that the fluid escaped from her left ear, that it came out in gushes and lasted a short time. This occurred before she came under my care.

The flow of fluid is also increased when the patient works hard, climbs steps, does any severe exercise, or when she becomes angered and excited. The patient carefully measured the quantity of fluid during waking hours on several days and it amounted to 32½ ounces per day.

An examination of her nose reveals the following: straight external nose, slight excoriation and a few fissures about the left vestibule and upper lip. The mucous membrane is congested in the right nasal fossa and markedly so in the left. Middle and inferior conchae in both nasal fossae slightly hypertrophied. The nasal septum is sharply deviated to the right and has a spur at the base anteriorly on the same side which touches the center of the concha nasalis inferioris. There was no evidence of any pus in the nasal chambers or post-nasal space. Post-nasal space slightly congested with an area of redness about the Eustachian orifices; otherwise negative. Tonsils average size and negative. Transilluminations of frontal sinusts revealed rather large ones. Left maxilliary antra slightly cloudy; right sinus negative. In carefully examining the nose on repeated occasions, I was unable to determine definitely where this fluid made its exit but I think it comes from the posterior portion of the roof of the nose and not from the middle meatus.

Examination of the left ear revealed that the tympanic membrane was intact and there was apparently no opening in the superior wall of the external auditory canal.

Examination of the fluid which escaped from the left nares: (1) The fluid was clear, colorless and without a sediment. (2) Specific gravity: 1.006. (3) 36 cells per cubic millimeter. This number is higher than normally found in spinal fluid but the majority of them were found to be epithelial cells and presumably from the nasal mucosa. (4) The fluid contained traces of albumen and traces of globulin; the total was about .03 per cent which is exactly the amount found in normal spinal fluid. (5) A trace of dextrose was found and the quantity appeared to be identical with that found in normal spinal fluid. (6) The chlorids amounted to 7.26 per cent which is exactly as found in normal spinal fluid. (7) The colloidal gold reaction yielded a 0000000000 reaction, which is exactly as found in normal spinal fluid. (8) The Wassermann reaction was as follows: Quantitative Wassermann reaction=negative. Serum 0.1 c.c.=Wassermann reaction negative. Serum 0.02 c.c.=Antigen I (cholesternized). Serum 0.004 c.c.=Antigen II (alc. syph. liver) Serum 0.002 c.c.=Antigen III (acet. insol. lipoids). Serum 0.001 c.c.

The general results of this analysis showed that the fluid had practically the identical composition of normal cerebro spinal fluid and Dr. John A. Kolmer who examined it regarded it as such.

The patient's eye apparently never gave her any trouble but when first seen I referred her to Dr. L. Webster Fox for ophthalmoscopic examination; the results of the examination are as follows: No prominence of the eye balls, no nystagmus, pupils normal in size and contour, react to light and acomodation normally, no photophotia or lachrymation, no paralysis of the occular muscles. The ophthalmoscopic findings on January 9, 1922, showed a slight optic neuritis or what might be called a fullness of the optic nerve in the left eye due to a probable blocking of one of the accessory sinuses. On January 10, 1922, however, there was marked improvement in the optic nerve sheath. The visual field was markedly contracted on the 9th and 10th of Jaunary 1922. Since that date and on February 21, 1922, the fields were not pronouncedly contracted as on the preceding examinations. The distal vision was not impaired.

A very thorough and complete neurological and mental examination was made by Dr. D. J. McCarthy who reported no evidence of organic disease of the brain, although he was of the opinion that the headaches were suggestive of a localized low grade meningitis.

My own observation of this patient is that she is extremely nervous and easily excited to fits of anger; at times she becomes very morose and will confine herself to her room for indefinite periods and only make her appearance at meal times; she refuses to speak to anyone; at times when she becomes angered, she goes into a fit of temper at which times she becomes apparently violent. At all times apparently she is very much depressed and becomes melancholic. On two occasions she made a verbal threat to commit suicide. Prior to the onset of her present condition, she was a very pleasant person, worked very hard at home with the house duties, was very handy making miniature dolls to represent world celebrities and was extremely clever with the needle in doing embroidery work; at the present time she refuses to do any housework or cooking and has lost her desire for doing any fancy work.

The X-ray examination of the head and sinuses was made by Dr. Henry K. Pancoast and revealed the following: Frontal sinuses, negative. Anterior ethmoid sinuses, clear. Maxillary sinuses, clouded on the left side. Nose, septum deviated to the right; right side entirely clear; left side clear above. The lower turbinates fill the nasal cavity fairly well. Sphenoid sinuses, clear. Posterior ethmoid, clear. Head, sella turcica normal; some calcification in

the frontal region, presumably of the meninges, over two small areas. This may not be of any significance.

Note: The clear sphenoid and posterior ethmoid sinuses would seem to indicate that the cerebro spinal fluid did not come down in this region. The occlusion of the left side of the nose would suggest that the escape was more on that side. The significance of the clouded left antrum is uncertain.

CONCLUSION.

Patient became so depressed and melancholic that it was deemed advisable to send her to the hospital for a rest cure. After being in the hospital two and a half months, the flow of fluid from her left nostril entirely subsided; two weeks following the cessation of the flow, she was suddenly taken with a chill, and a rise of temperature to 104, associated with this was numbness of the entire body and severe headache. Two days later she went into a semi-comatose state with alternate periods of licidity. The following day she developed a facial paralysis and tremors of the entire body. Two days following she developed auditory nerve deafness and three weeks later died of acute encephalitis.

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THE NEW YORK ACADEMY OF MEDICINE.

SECTION ON OTOLOGY.

(Continued from page 564)

DISCUSSION.

Dr. Palmer had referred to the fact that his case had a total loss of vestibular reaction and still had some hearing. It was hardly consistent with the history that the patient had some cochlear function with total absence of vestibular reactions. There was no spontaneous past-pointing, but past-pointing was brought about by the caloric test; this indicated retention of some vestibular function. These cases must be checked up by repeated tests with the head in different positions. A noise apparatus is of course absolutely essential in determining the question of total unilateral loss of hearing.

It is important to present cases such as the interesting one of Dr. Palmer's as they throw light upon an important phase of labyrinthine disturbance. It is necessary to keep in mind the fact that not only do the tests point to some interference with labyrinthine function, but not infrequently changes in vestibular reaction caused by deeper lesions—cerebellar or brain-stem—can be determined.

DR. JOHN GUTMANN said that (while he did not fully agree with Dr. Maybaum on the point that there might be injury of the cochlear and the vestibular nerve might not function, etc., etc.) the cochlear nerve is much more sensitive than the vestibular nerve. In general the examination for unilateral deafness is often hard to establish. The method of excluding the good ear, as practiced up to recently, is very unsatisfactory; for one cannot exclude the good ear from the hearing. Dr. Palmer reported that C.3 and C.4 were slightly heard. . . . How did he get it? He had to exclude the good ear. How could he do it? Probably by the use of the Barany noise apparatus. This noise apparatus excludes not only the hearing of the good ear but also of the bad ear, so that if there is some perception left in the bad ear we do not notice it because the noise deadens it. Dr. Guttman said that while he agreed that there was probably deafness on that side, the way in which the Doctor presented it was not very conclusive.

DR. PALMER, on closing, said he expected to hear some remarks on the turning tests. He did not consider himself as yet expert in that method but hoped to be at some time. In reading over many cases, he had found a great variety of responses in these cases and found it very difficult to localize the exact lesion in this particular case. Replying to Dr. Gottlieb, Dr. Palmer stated he had used the noise apparatus in testing for the C.3 and C.4 forks, but he had not douched the ear in making these tests. That point he was very glad to pick up. The noise apparatus was not used in testing the left ear for voice. In reply to Dr. Maybaum he stated that he did not consider this case one of complete loss of function of either the vestibular or cochlear branch of the eighth nerve.

The special interest in this case was the percentage of disability and the prognosis of the case. We have today altogether too little to depend upon in estimating the percentage of disability either unilateral or bilateral, or in estimating the prognosis of such cases, and it would be a great help if it were possible to secure some standardization of these hearing and vestibular tests, such as we have in the eye methods. Dr. Palmer expressed his appreciation of the discussion, and said he realized there was yet much to be learned about this particular case.

Suspected Mastoiditis. Dr. Harold Hays.

To appear in a subsequent issue of The Laryngoscope.

DISCUSSION.

DR. LAW said that the X-ray report on Dr. Smith's case read that the mastoid contained granulations and pus, with evidence of bone softening but no evidence of actual bone destruction. That did not indicate a very serious condition—not one which was operative—and from that and from the history an operation was postponed. That report alone would not indicate operative interference, yet it indicated some trouble.

Dr. Hays, in his excellent paper, had stated one point which Dr. Law has been emphasizing for years—the importance of consulting with the Roentgenologist as a clinician. He may not possess as much clinical knowledge as the clinician, but he has had some experience and was entitled to some consultation over the case. It was not the province of the Roentgenologist to state whether or not a case should be operated except in consultation with the surgeon.

Dr. Law took exception to the term "cloudiness" used in the report—it can mean so little. Many cases show a departure from the normal. yet these cases get well. The most important point of an X-ray report on which to base a diagnosis or opinion is the condition of the bony walls within the mastoid process—in fact, two points: the size and thickness of these wallls, and the character of the walls. A mastoid such as Dr. Hays had cited did show actual bone destruction, but an X-ray plate which does not show evidence of bone involvement certainly indicates a good chance for recovery of the mastoid. Many interpretations are attempted on very inferior plates. Many plates are submitted for interpretation made by men who perhaps do not take many plates, and such mastoid plates are often useless. A mastoid plate requires the most perfect technique, attention to detail, and careful consultation with the surgeon in order to base an opinion on the condition and the character of the bony walls entering into the formation of the mastoid bone, particularly in the region around the antrum. If the surgeon and the Roentgenologist will get together and discuss the case a much better diagnosis can be made. Another suggestion to the otologist: Be generous and report to the Roentgenologist with just as much glee when he is right as when he is wrong.

DR. LEWALD illustrated by lantern slides two cases of sinus thrombosis and stated that operative intervention should follow, when the X-ray findings showed destructive lesions of the bone, even though the clinical evidence was not conclusive. Dr. LeWald said further, that, in cases in which the mastoid cells were found cloudy on Xray examination, operation was not indicated unless the clinical evidence was sufficient to make operation advisable. In doubtful cases it had been found that subsequent X-ray examination was of great value in showing a lessening of the cloudiness and hence the indication that operation was not necessary. On the other hand, the subsequent radiographic examination had disclosed increase in the cloudiness and made operation advisable.

He had followed a number of cases of this sort at St. Luke's Hospital and in no case had found that an operation had been performed without justification.

DR. BLACKWELL spoke of mastoid deafness, which Dr. Hays had not mentioned yet, which he considers of great value in deciding whether operation is indicated in a case of suspected mastoid. Where one makes it a routine practice to test the hearing in cases of mastoiditis, one quickly observes an amount of deafness which is quite characteristic in those cases where operation is indicated. Dr. Hays had not said much about the character and force with which the pus is discharged from the ear drum. If it is excreted as you watch it, one drop forming in a few seconds and followed quickly by another when wiped off, that is a very good indication that operation is required.

DR. MAYBAUM thought that Dr. Smith's case was worthy of careful consideration. One is frequently confronted with the problem of deciding the origin of sepsis occurring in children who have discharging ears. When an opinion is rendered that the ears are not responsible for the sepsis, other causes of the condition must be sought. He then cited cases of sepsis with bacteriaemia seen in consultation in the Pediatric Service at Mount Sinai Hospital; the ear conditions had been definitely ruled out. In two instances of such sepsis the ear suppuration had fully resolved. One died of meningitis, the other of peritonitis. At the autopsy the ears and all other conditions were found negative. The only condition which the pediatrians could hold responsible for the fatal sepsis was a marked naso-pharyngitis which both children had had. Serous membranes are particularly prone to involvement in such cases. Disappearance of the bacteriaemia with the onset of involvement of the serous membranes was a curious fact observed in these cases.

Dr. Smith had referred to an important fact—that his patient did not appear to be very sick, in spite of the prolonged duration of high temperature rises. This is quite characteristic of these cases. Many such cases are due to enlarged glands, pyelitis, naso-pharyngitis, etc.

Dr. Hay's paper was very interesting and very important. In doubtful cases of mastoid involvement, X-ray examination is frequently an invaluable aid. The findings must be checked up by the clinical picture.

Dr. Maybaum himself follows the method suggested this evening of having repeated X-ray examinations from the earliest stage of the disease, when only a suspicion is detected of a possible mastoid involvement. Among the signs and symptoms of mastoid involvement, sagging of the posterior-superior bony canal is of great importance. Dr. Hays had remarked that some of his cases presenting this sign have recovered without operation. This has not been Dr. Maybaum's experience. On one or two occasions a suspicion of sagging was present, the case recovering without operation. With real sagging of the canal wall other signs are usually present. Diminished hearing with definite sagging is sufficient ground for interference. X-ray examinations in such cases usually confirm one's diagnosis.

DR. LEDERMAN expressed hearty agreement with Dr. Hays' conservative attitude toward X-ray findings for operating on mastoid cases. This question had been discussed a year or so ago and at that time Dr. Lederman expressed himself as standing just as he does now—that he would not operate upon any mastoid upon the X-ray report alone; the report must be confirmed by the clinical symptoms. In a case of empyema of the chest seen in the Lebanon Hospital recently, the child had septic temperature as high as 106° and had been operated upon for pulmonary infection. The temperature persisted and a local infection of the auditory canal appeared. The question arose whether the temperature came from the empyema. There was no bacteriemia, but the external otitis occluded the canal and it was impossible to see the membrana or the condition of the middle ear. The radiographer reported a pathological mastoid. The aural symptoms however did not seem to warrant opening the mastoid of a child so ill, recovering from a surgical empyema. A large furuncle was incised, and as the local tumefaction subsided the tympanic picture did not warrant interference; the child recovered without mastoid operation. In another case treated in association with an eminent radiographer the patient was radiographed four times in two weeks; each time the indications were reported to be more urgent for going into the mastoid. The man had a chronic bilateral catarrhal otitis media before the infection of the middle ear and mastoid. The membrana had been incised early on account of the thickened drum. There was very little tenderness over the mastoid, but there was a continuous discharge of pus with a teat-like projection of the membrana. The situation was rather trying. The patient read the X-ray reports urging operative in-

tervention, the last one indicating a perisinus abscess, but operation was refused. That patient's symptoms subsided without surgical treatment of the mastoid. In still another case recently seen, a young child in the pediatric service of Lebanon Hospital developed an otitis in both ears, with high temperature. There was no external evidence of mastoid involvement, so far as could be detected, but the pediatrist feared mastoid infection. Dr. Lederman did not feel warranted in operating on the clinical evidence, and in a few days the child developed a pneumonia. No mastoid operation was performed. Children may have central pneumonia with physical signs masked, with very high temperature and with both ears congested. It is not always an easy matter to eliminate a congested middle ear as the cause of temperature, but the cases presented tonight and the discussion show the desirability of not operating too hastily. In young children the mastoid antrum is involved in all infections of the middle ear, but that does not imply that all such cases are surgical mastoids. Drainage of the antrum through the middle ear depends mainly upon the anatomical situation of this cavity. A cloudy appearance of the mastoid in X-ray findings is not sufficient evidence to operate. If X-ray photographs are taken early this condition will usually be found, as the mucous membrane lining this cavity is generally involved in acute inflammatory changes of the middle ear.

Dr. Glogau said that in some cases of suspected mastoid an attempt should be made to exclude caloried and diseased tonsils and adenoids as a possible cause of the infection of the mastoid and by their removal bring about a possible cure. Since he had read a paper on that subject before this Section he had heard from a number of men all over the country that they had avoided mastoid operation by this tentative removal of adenoids alone or together with tonsils. In all cases reported the mastoid had cleared up. . . . It was always worth while to try to save a child from a mastoid operation, for as the discussion had shown tonight, many cases have been operated upon where it was not a real mastoid condition. The child must be watched carefully after the removal of tonsils and adenoids and if definite mastoid symptoms develop, or those present should not disappear within reasonable time, the child should be operated upon.

Dr. Marvin Jones cited an instance to bear out Dr. Hays' conclusions. Recently a child came in with a prolapse of the posterior wall. It was sent for an X-ray examination and the report came back that pus and granulations were present but no destruction of bone. The mother was told to bring the child back in a week, and only that morning they had returned with the statement that for the past three days the ear was perfectly dry.

Dr. Hays expressed appreciation of the number of interesting points brought out in the discussion, and commented on what Dr. Smith had said about interpreting high temperature associated with inflamed glands of the neck and suppurating middle ear. Some years ago he had treated a child with enlarged neck-glands; the temperature went up to 106°, and the child had a discharging ear for weeks with a temperature ranging between 105° and 106°. He felt sure that the temperature was due to the enlarged glands, but while he was out of town another otologist was called in and the father was told that the child had a double sinus thrombosis. The blood culture was negative. A few weeks later the child developed an erysipeloid condition, and they called in another otologist who made a diagnosis of double sinus thrombosis and erysipelas, and said there was no chance for the child. When he returned that night, he told the father that he should ignore all the diagnoses made while he was away, as the child was improving. The child got well, and was another illustration of the fact that when a case is complicated with infected glands or a reddened throat, both of these conditions must be taken into consideration.

Dr. Gottlieb had been interested in the rapid healing of these mastoid wounds. In most cases, there are the usual findings. In one case, the operation was carried deep into the mastoid cells without finding any pus—only necrotic bone at the tip of the mastoid; that was cleaned up and the wound healed. In these long delayed cases when you do clean them up you get quicker healing than in the acute cases. It is not unusual to have a case which has been discharging for three to five weeks heal up very quickly after proper operative treatment. Dr. Hays said the technic he employed was simple and he would be glad to demonstrate it at any time. Referring to Dr. Blackwell's remarks about deafness and the rapidity of the discharge, Dr. Hays said that in young children the question of future deafness was very important. This should be taken into consideration when deciding on operation and is as important a the suppuration itself. In the paper he had spoken of the amount of discharge which could be taken care of by suction.

He was very glad to hear of the case of sagging of the posterior wall reported by Dr. Jones. Many of these cases do recover without operation, but when the sagging is associated with narrowing of the canal wall it is wiser to operate. If one has a case of acute suppuration of the middle ear and feels justified that the tonsils and adenoids should be removed, they can be removed, but it is better to wait until the temperature becomes normal. Dr. Hays said he did not like to be critical about these matters, but one must use a certain amount of surgical judgment as to operation and conservative measures. It is not a question whether or not the patient can get along without operation, but whether he will run the risk of complications by delay. You must present the question from the conservative point of view.

Dr. Hays said that the more he sees of X-ray pictures the more he agrees with Dr. Law—that the man who takes the picture should be one with whom the surgeon can consult and reach a conclusion. A cloudy mastoid is no reason for operation unless there is other definite evidence or clinical symptoms to corroborate the picture.

Dr. Hays said that the Section had had a most instructive lesson on a subject about which very little is known. The most important practical point was the different way in which X-ray pictures can be taken to show up the mastoid cavity.

The Development of the Mastoid Cells and Variations in Anatomy from the Viewpoint of Pathology and Operative Procedures. (A Lantern Demonstration.) Dr. Nolton Bigelow, Providence, R. I.

At the present writing Dr. Isaac Gerber and the writer have radiographed one hundred temporal bones from the collection of Dr. B. Alex Randall. This work forms a part of some investigations regarding the anatomy of the mastoid that are being carried out in collaboration with Drs. Joseph C. Beck anl Samuel Iglauer. While radiographing the bones we discovered a method of projecting the mastoid onto the X-ray plate which has proven most useful when applied to the living.

In radiograms taken in the usual angle with the two meati superimposed, the petrous pyramid is projected backward as a dense triangular shadow that obscures the region of the antrum. This is of no great consequence where the mastoid is completely pneumatic but where the mastoid cells are limited to the immediate vicinity of the antrum, as is the case in infants and young children and in 20 per cent of all adults, it is obvious that the knowledge to be gained from the usual X-ray examination will, in all probability, be rather meagre. In the "occipital" projection the petrous pyramid is thrown forward so as to overlie the zygoma and the glenoid fossa, with the result that the antral region is as clearly portrayed as the rest of the mastoid; but as the zygomatic cells are then obscured by the petrous pyramid, both projections are necessary for a complete examination. That the latter projection not only discloses whatever cells be present, irrespective of the age of the

patient or the type of mastoid, but also corresponds roughly to a vertical cross-section of the mastoid in the sagittal plane has been demonstrated repeatedly both by the sectioning of temporal bones and at operation.

In our series of radiograms we find the counterpart of every type of structure described by Wittmaack in his recent work, "Ueber die normale und die pathologische Pneumatisation des Schlaefenbeines." In addition there are a few types of structure which, though not therein described, seem to dove-tail perfectly with his observations of normal and abnormal development. We therefore, conclude that variations in anatomy are determined by the development or, as the case may be, by the lack of development of the mastoid cells.

Moreover, it would seem as though the study of a large series of radiograms, or sectioned bones for that matter, would be sufficient to convince even the most sceptical that variations from the "typical" anatomy have considerable bearing on the pathology of the mastoid. In the first place, there is apparently no such thing as a "typical" mastoid; for of the hundred bones radiographed up to date there were only two that conform to Wittmaack's ideas of normal development. With the mastoid completely pneumatic, the signs and symptoms of mastoiditis will, naturally, conform to the text book descriptions of this disease; but, if the pneumatic structure of the mastoid be limited to a few cells in the vicinity of the antrum, it is evident that typical signs and symptoms may be entirely absent notwithstanding the fact that in this type of mastoid the possibility of intra-cranial complications is greatly increased. In the one case, the need for operation may not be urgent though signs and symptoms be unmistakable; while in the other case, immediate operation may be imperative though the usual indications be not in evidence. If the anatomy of a suspected mastoid be determined, with special reference to the amount and the distribution of the mastoid cells, it seems self-evident that the observer will be better able to predict the probable course of a mastoiditis and to establish his indication for operation on a less empirical basis than is otherwise possible. This knowledge can be obtained previous to operation only by means of the X-ray, for the configuration of a mastoid gives no clue as to the underlying structure; a point we have proven to our own satisfaction by studying the external aspect of the bones before their subjection to X-rays. In this study we had the advantage of no obtruding soft parts, besides being able to definitely locate the sinus. Under these favorable conditions our estimates as to internal structure were wrong in over 50 per cent of all cases. This being the case, how much reliance can be placed on a similar guess applied to the living?

DISCUSSION.

DR. GOTTLIEB congratulated the otological section upon having the privilege of hearing Dr. Bigelow present this very important subject so ably and clearly. Those of us who have taken the opportunity of reading Wittmaack's work naturally are able to appreciate the subject better than those who are not familiar with it. A subject matter of this kind cannot be grasped by our presentation. The development and pneumatization of the mastoid bone as shown here tonight and by Wittmaak in his epochal research has very practical application. It is definitely known that the type and extent of the development of the mastoid will predestine the character and course of an infection of the mastoid bone in any given case.

DR. HAYS said that the Section had had a most instructive lesson on a subject about which very little is known. A most important practical point was the different way in which X-ray pictures can be taken to show up the mastoid cavity.

SECTION ON RHINOLOGY AND LARYNGOLOGY.

April 25, 1923.

Study of Sinusitis in Children. (Preliminary Report.) Dr. J. M. Lore.

(*To appear in a subsequent issue of* THE LARYNGOSCOPE.)

DISCUSSION.

DR. MACKENTY said that this was a most important subject and one in which he had been interested for some time, though he had not operated as often as it seemed indicated since he had some fear of going too far with children. Dr. Dean kept him informed in regard to the considerable operative work which he was doing on children, and had told him of cases in which the exenteration of the sinuses had cured many serious conditions.

He then told of a child referred to him by Dr. J. A. Miller, for several years suffering from peribronchitis and bronchitis. He was in a very stupid mental condition, not being able to carry on his school work. He had a chronic pansinusitis (purulent). An intranasal pansinusitis operation was done, by Dr. MacKenty and the results were very poor. Dr. MacKenty then decided to make an effort to cure the condition by an external operation. A double external operation was performed, and as a result the child was cured of his toxemia and his chronic bronchitis, his mentality improved, and he was now in perfect health. That was the only instance in which he had gone in externally to cure a case of this exact kind (chronic loxic sinusitis). There is no doubt that in many cases such radical work is justifiable on children rather than let them grow up in a state of misery and disease. Secondary chest infection from sinus diseases, chronic in type and in children, spells invalidism in adult life.

DR. MACPHERSON said that these conditions should not be overlooked by the rhinologists since it is probable that many pediatricians do not observe them at all. The rhinologists realize that nasal discharge susceptibility to colds, etc., do not disappear after the removal of the tonsils and adenoids. One of the important objects of this paper was to bring the attention of the profession to these children and the need for considering what ought to be done for their nasal accessory sinuses.

DR. UNGER emphasized the importance of doing bacteriological work on these cases of chronic discharge from the nose in children. Twelve years ago he examined all the children that came to Mount Sinai Dispensary for many years—many thousands of children—and saw many with purulent discharge from one or both nostrils, sometimes blood streaked, and existing for a period of two weeks to two or three years. An enormous percentage of them were found to give diphtheria bacilli on examination. Every case of purulent discharge from the nose of a child of the ages mentioned by Dr. Lore ought to have cultures made for diphtheria bacilli. The term diphtheria is usually associated with an acute condition, but the bacilli can live in the nose for two or three years, and in many of these chronic cases the causative factor is found to be a nasal diphtheria.

DR. SEYMOUR OPPENHEIMER regretted that he had come too late to hear Dr. Lore's paper, but he had seen his X-ray plates and no one could fail but to be impressed by the fact, which he has brought out repeatedly that the sinuses often develop in children much earlier than is usually recognized and that sinus disease is present more often than is generally considered. In the case of every child suffering from an acute infectious disease, scarlet fever, influenza, etc., with a purulent discharge from the nose, the discharge does not come from the nasal mucosa per se, but from an accessorry nasal sinus disease and it is up to the rhinologist to determine from which sinuses the discharge comes from. This is not always so simple as it seems.

Dr. Oppenheimer said he had not infrequently found in children evidences of marked post-nasal discharge, and with the naso-pharyngoscope had been able to see pus issuing from the ostium of the sphenoid. There is little doubt that many children who suffer from a constant succession of head colds have an underlying condition of sphenoidal or ethmoidal disease. Dr. Lore's pictures demonstrate how large the sinuses are at times in the early age of children. The antrum is of course present at birth, although rudimentary and it is by no means unusual to find an antrum infected in children but a very few years old. Dr. Dean of Iowa City and himself have reported many cases where the focus of infection was located in the accessory nasal sinuses in very young children. In all cases of obscure temperature where one cannot put the finger on the exact cause, the accessory nasal cavities should be investigated.

In 1911, Dr. Oppenheimer presented this subject to the Pediatric Society of the Academy, and many of the gentlemen present stated while they had observed a large number of children for years they were not in accord with Dr. Oppenheimer's views, and questioned whether nasal sinus disease existed as often in children as had been stated. In 1919, when Dr. Oppenheimer presented the same topic before the American Medical Association, Dr. Kerley was invited to open the discussion, and he then said that as the result of his further observations since hearing the first paper he was convinced that accessory nasal snus disease did exist often in children as Dr. Oppenheimer suggested. Many of the pediatrists pay so much attention to the discharging ears of children yet if they examined the noses of these with ear disease they would probably find that these cases all suffered from accessory nasal sinus disease as well. The profession generally is accustomed to looking at these cases of ear disease and disregard the muco-purulent nasal secretion which almost always comes from one of the sinuses, usually the ethmoidal tract. Most of these cases gradually subside and become quiescent or latent, but are not cured, and at the slightest provocation manifest themselves again. It was most interesting to know of some of the work which Dr. Dean has been doing which work was stimulated by Dr. Oppenheimer's previous work. Dr. Dean makes it a practice frequently in cases that show a focal manifestation to puncture the antrum at the time of the tonsil operation and it is astonishing to note how often he gets a positive washing.

These conditions are so often overlooked that the presentation of this evening makes us more alive to the situation.

Dr. Lore, referring to the operative work on children spoken of by Dr. MacKenty, said that that was something we would have to come to. The cases that he had showed presented marked deviations of the septa. It was not claimed that this simple procedure would cure these conditions but it would help them in case later work had to be done. No acute cases had been considered in the series, but an acute case had been seen in a child a year and a half old, and by clearing up the sinus condition the child got well. Dr. Macpherson had sounded the key note of the whole matter, for the general practitioner sees the early cases.

The bacteriological study was a very important part of the work and at the same time a very difficult one. The question of technique and culture had been considered, but one cannot hospitalize these cases and take cultures. A preliminary investigation with washings, etc., had been suggested, and any suggestions as to methods would be verry acceptable.

Diphtheria does not exist many more times than is realized, as well as Vincent's angina.

The question of diet is a very important factor. Almost all of these children are undernourished and underfed, and almost all had some chronic condition of the sinus with a thin watery discharge. It was also interesting to note that in connection with these sinus conditions there was a large proportion of chronic ear troubles, and nothing can

be done with these ears until the sinus condition is cleared up. It means a lot of work . . . to do this. In connection with the submucous operation in children, Dr. White had been working on that in a number of cases.

Large Mixed Tumors of Soft Palate. Dr. John E. MacKenty.

The case was presented to demonstrate the result of the removal of a very large tumor from the soft palate. Dr. MacKenty said he had seen only two other cases of the kind in his life though in a large clinic like that at the Manhattan Eye, Ear and Throat Hospital he had occasion to observe many patients in the course of a year. The other tumors were similar in type but small.

The patient was a Salvation Army worker who came from Dr. Pyle of Jersey City in January, 1293. Her trouble began 8 or 9 years ago with a continuous pain over the roof of the mouth and shooting up to the right ear. This pain continued for two weeks and then disappeared after which she noticed a small pin-point development on the side of the palate, which had enlarged steadily since. At various times she had some swelling of the glands of the neck, which however was not permanent and did not exist when examined by Dr. MacKenty. The examination showed an enormous growth of the soft palate extending upward, crowding into the nasopharynr and obstructing the hypopharynx so that one could not see much of the base of the tongue. It projected half way to the front teeth. She had sought relief with various men who said they did not want to remove the growth for fear they would have to take the soft palate with it, which would destroy her speech. She could hardly speak when she was first observed. At Johns Hopkins they said the growth would have to be removed, for they thought it was malignant. Dr. Pyle of Jersey City referred the patient to Dr. MacKenty.

The growth was in the tissues of the soft palate and looked like a multiple fibroma; it seemed to be encapsulated, and did not look malignant.

The operation was performed under ether anesthesia and the growth was dissected out, being removed very easily. It was sent to a pathologist who reported it to be fibrous adeno carcinoma.

REPORT: "*Microscopically* the specimen consists of a firm, irregular, nodular encapsulated mass measuring 6.5 x 5 x 4 cm. Upon gross section it shows lobulation with a rather translucent surface.

"*Microscopically* sections show a dense network of hyalinized connective tissue throughout which there are scattered irregular masses of epithelial cells. Some of the cells form imperfectly constructed mucus glands. Some of the cells show mitosis. In areas the cells show considerable mucus. The connective tissue stroma present shows some mucose degeneration.

"*Diagnosis*: Fibrous adeno-carcinoma.

"*Remark*: This is undoubtedly a carcinoma but it appears to be of rather slow growth.

"Not being satisfied with this report, although made by an excellent pathologist, as clinically the growth did not appear to be malignant, the specimen was sent to Dr. Wood of Columbia, who disagreed with the former report, and said:

"'I think the tumor belongs to one of the group of palatal mixed tumors which often contain cartilage and sometimes bone, in addition to epithelial structures. These tumors do not recur when thoroughly removed, and even if recurrence takes place should be attacked again as the recurrence remains local, not involving the lymph nodes.'"

Dr. Voorhees asked Dr. MacKenty to describe the steps of the operation.

Dr. Forbes said he had never seen such a tumor of the soft palate in all his practice and congratulated Dr. MacKenty on this case.

Dr. MacKenty, replying to Dr. Voorhees, said that the soft palate was split along the line of axis of the tumor, the capsule was found and

the tumor was shelled out. The main trouble was to maintain anesthesia without asphyxia. After removal of the growth the palate was tucked up by running puckering stitches through the cavity. This kept it from falling into the larynx. There was a little infection of the wound afterward, but the patient finally recovered with a perfect palate and with perfect speech.

X-Ray Therapy in Chronic Tonsillitis. Dr. James W. Babcock.

(*To appear in a subsequent issue of* THE LARYNGOSCOPE.)

DISCUSSION.

DR. FORBES said that Dr. Witherbee's feeling in regard to this line of treatment was most enthusiastic. He himself had had the fortune to see only two of these cases which he could trace back to men who were really conservative therapeutic radiologists. One of these patients said that during the last year he had had two attacks of tonsillitis and is making arrangements to have the tonsils removed. The second patient was a young man of thirty whose family were enthusiastic in regard to the treatmnet. He had had twelve exposures and the results were absolutely nil, and he too had decided to have the tonsils removed. Cultures showed the typical bacteriology seen in the tonsils.

Dr. Forbes said that it was important to get the consensus of opinion in regard to this treatment of the tonsils, and that the section should go on record as approving or disapproving this therapeutic measure.

DR. MACKENTY commended Dr. Babcock for presenting the whole subject in such a clear and concise manner. As shown by the slides on the screen, there was no change in the bacteriology between the tonsils treated by radium and those treated otherwise. In his own personal experience he had observed many cases treated by this method, but had not yet seen any which were cured; they were improved and felt better for a few months but the symptoms returned and the tonsils gave as much trouble as before. One type of tonsil undoubtedly yields to this treatment, that is the hyperplastic tonsil in young children, but that type of tonsil is not seen in adults; it is not a toxic tonsil and does not properly come under the discussion.

Dr. MacKenty said he had followed up this matter himself in a number of cases by microscopic examination and bacteriologic examination, and he agreed with Dr. Babcock that he had not seen any real change in the tonsils treated by radium. Several patients who had been treated by this method complained of dryness of the throat. There was a grave effect upon the glands of the neck which were there for protective purposes; they first feel the shock of the radium treatment and are very susceptible to it, whereas the tonsils are not so. Dr. MacKenty concluded by saying that he is opposed to this method of treatment.

DR. L. M. HUBBY reported on a case treated by this method: The patient, Mrs. H. L. A., was thirty years of age and had been under observation since February, 1920. Her maternal grandmother had tuberculosis of the lungs; the family history was negative for rheumatism, gout, cancer, and nervous disease. The patient had pertussis and measles as a child, with no sequelae. Her heart, lungs, and kidneys were normal. During the past she had had repeated recurrent attacks of slight tonsillitis; no cervical adenitis or other complications.

In the spring of 1922, Dr. Lewis G. Cole gave the tonsils three X-ray treatments at intervals of two weeks. Following such treatment the parotid glands showed considerable reaction on the following day, swelling and becoming quite tender. Her tonsils which at first were not large, barely visible when the throat was relaxed, became smaller a month after the treatment was started. For the following six months she had less trouble with her throat, but these were the summer months. In November, 1922, she had a severe attack of acute cryptic tonsillitis, followed by acute pyelitis within a few days. She was in Chicago at the time, and immediatelly after the subsidence of the tonsillitis she

had both tonsils removed under local anesthesia by Dr. Shambaugh. The pyelitis promptly disappeared.

This case illustrated the point that although the X-ray decreases the lymphoid elements of the tonsils it has no curative effect on disease of the crypts or of the connective tissue stroma. Dr. Babcock had pointed out the time element in deciding the question of tonsillectomy with its removal of the source of infection versus six or more weeks of treatment with the X-ray.

DR. MCCULLAGH considers the method absolutely worthless in causing a complete disappearance of the lymphatic tissue or getting rid of the bacterial flora of the tonsils. He had seen in all about a dozen cases in which all of the lymphatic tissue, deep crypts, and pus or caseous material persisted; and had operated upon two cases which had had ten to twelve X-ray treatments. In these latttr cases the tonsils consisted of a dense ring of fibrous tissue with lymphatic tissue persisting in the center, and numerous deep crypts which were filled with cheesey plugs. Culture from one of these showed a very virulent type of streptococcus hemolyticus and from the other a non-hemolytic streptococcus. The operative procedure on these cases was more difficult than in the untreated ones, resembling markedly cases which have had repeated attacks of peritonsillar abscess. The post-operative reaction was also more marked.

It may be that the subjective symptoms are relieved in certain cases, giving it a limited field of usefulness where operation is contra-indicated but in his opinion it completely fails to live up to the claims made for it by its sponsors.

DR. ROBERT FOWLER said there would not be time to take up a large number of individual cases of the kind so well described by Dr. Babcock, where X-ray treatment had proven disappointing. The throat surgeons hav been hoping to see good results from this method.

The whole picture could be given by a recitation of a single case which he himself, had seen last summer. A girl who had undergone a course of treatment for infected tonsils and who still suffered from rheumatism, quicky recovered from the rheumatism after the tonsils had been removed. Examination showed one tonsil fibrous throuohout; the second tonsil composed of fibrous layers between which were abscesses. In this particular case the attempt to treat the tonsils with X-ray had been a great disappointment to the patient. The case is chosen as being a characteristic one.

DR. KELLEY reported on three cases from Dr. Malcolm's practice and two from his own. These patients had received anywhere from nine to ten X-ray exposures, and between January 1, 1921 and the present time all had had one or more attacks of tonsillitis. Mrs. H. was treated about the 1st of December, 1921, and had 9 or 10 treatments. She still had her tonsils but had two or three attacks of tonsillitis during the past year. The next case, Mr. F., forty-three years of age, had an attack of tonsillitis in the summer of 1922 and since then had had nine treatments by X-rays. At present he has badly infected tonsils, which will be removed shortly. H. P., had 9 treatments by X-ray during 1922, and in December 1922, had an acute attack of tonsillitis, without any relief of his symptoms in the meantime.

Of his own two cases, one was a policeman who had received 15 treatments by X-rays. When he first came to the office three months ago he had fairly large tonsils, and was still having symptoms, and on pressure one could force a fair amount of pus from either side. The other patient was a woman, aged 40, who had received 9 treatments, and came to the clinic complaining of sore throat. She had a pair of diseased tonsils that had flared up.

In connection with X-ray work they had tried some radium treatment in 1922, using 20 to 30 millegrams of radium for an hour to an hour and a half, and after 15 cases had been treated it was decided that it

was possible to obtain some reduction in the size of the tonsils, but that the infection following the introduction of radium needles was worse than the previous condition. Several of the patients set up a tonsillitis.

DR. MACPHERSON stated his experiences with three cases. Frequently the statement is made that the X-rays have not been utilized properly—that was the claim made by Dr. Witherbee and others. Two of these cases were treated by a man who had been thoroughly approved by Dr. Witherbee. One of these two patients developed acute rheumatism, which might however have happened had that treatment not been used. The treatment was continued for several months and the patient stated recently that she had been in Fordham hospital with acute rheumatism for most of the summer. Examination of her tonsils revealed much yellow pus. The other case was an articular condition in an old woman, and the treatment was kept up for several months without any reduction in the amount of pus. Both cases had fibrous tonsils and no claim has been made that fibrous tissue is discharged by the X-ray, but the claim is made that the crypts are more shallow—nevertheless a cavity is left in which bacteria grow.

Dr. MacPherson then suggested the advisability of appointing a committee and getting Dr. Witherbee to treat a certain number of cases chosen by himself and the Committee, and so obtain some definite idea of what he could himself accomplish in these cases. The reports from all over the country show that most men are disappointed over the results of X-ray treatment of the tonsils.

DR. FRANCIS CARTER WOOD said that he was a good deal astonished to see so much criticism from the various speakers on the results of the radiation treatment of enlarged tonsils based upon such a small number of cases. It would be easy enough to criticize tonsil surgery on the same basis. Everyone is familiar with the fact that the removal of tonsils is unpleasant, the procedure is sometimes followed by severe hemorrhage, abscess of the lung, and occasionally by death, but to criticize tonsillectomy, in view of these facts only, would be quite unscientific. He had watched some ninety cases during the past four or five years, at the X-ray clinic at St. Luke's Hospital, and at the Crocker Laboratory, for a few cases of tonsils had been rayed in the Crocker Laboratory by one of his assistants long before Witherbee and Murphy had suggested the method, but even with this not inconsiderable material, the speaker felt that he could offer no final conclusions.

There are, however, a few simple rules which should be clearly understood. The first is that a tonsil with a peritonsillar infection should be treated as a surgical condition and never rayed. A patient having frequent recurrences of peritonsillar trouble with a cardiac lesion should also be operated upon if possible. An acutely infected tonsil should never be rayed, but there seems to be a great deal of confusion in the minds of those who excise tonsils as to infection. It is not uncommon to have a specimen sent to the laboratory marked "tonsillar abscess," and find absolutely no evidence of abscess. The speaker recently looked over the records of some 500 tonsil cases at St. Luke's Hospital and found no abscess microscopically in those which had been excised. Often also it is assumed that the presence of streptococci of various types indicate tonsillar infection. Patients frequently come in and say that Dr. So-and-So has told them that they have "a green streptococcus or a hemolyptic streptococcus and the tonsils must therefore be removed."

The mass investigations on the flora of normal tonsils conducted by the army bacteriologists showed that streptococci of one or anothed type are almost always demonstrable in the tonsillar crypts. The mere presence of an organism therefore is no evidence of disease of the tonsil and certainly no evidence for immediate excision.

A considerable number of the patients who came to me have been advised to have tonsillectomy, but prefer to try raying as a means of escape from operation. A thorough examination fresuently reveals but little

change in the tonsils, but evidence of infection elsewhere. Obviously if these cases had been rayed, another failure of X-ray therapy would be recorded.

One thing should be clearly understood and that is that the X-ray does not kill the bacteria in the tonsil. Micro-organisms of any type are only destroyed by enormous doses of X-ray, far greater than the body tissues could stand, so that any improvement which may result from radiation is due solely to the shrinkage of the tonsillar material, and diminution in the depths of the crypts.

It has been said as a criticism that, after raying, tonsils will again return. This is obvious, as under the present technique of raying very small doses are administered, probably not enough in all instances to destroy all the tonsil lymphoid tissue. I have examined such tonsils which have returned in the course of a year or two and found them normal in microscopic appearance. Whether all rayed tonsils will return, we do not know. The presence of some normal tonsil tissue in the throat can hardly be regarded as a disadvantage.

In regard to the dangers of radiation, much has been said of the possibility of burning the patient. It is true that an X-ray machine in the hands of as incompetent radiologist is nearly as dangerous as a knife in the hands of an incompetent surgeon, but it is always possible to avoid the incompetent.

Many patients have come with ridiculous stories told them by their laryngologist concerning sterilization from the X-ray, permanent dryness of the mouth, inevitable occurrence of cancer after radiation of the tonsil, cessation of growth in children owing to the killing of the pituitary gland, etc. All these fairy tales are unworthy of the profession. The dose given in raying the tonsil is only about twice that necessary for a full series of dental radiography, yet no doctor hesitates to send a patient for a dental series and to repeat in a few weeks if necessary.

In regard to the effect of X-ray on tonsils, so far as he had observed them, Dr. Wood said, that in children the tonsils were easily reduced, as a rule, by eight small doses of X-ray spread over two months. That many of these children had been much better and did not have their usual winter colds and sore throats. Sometimes this amount of radiation will not reduce the tonsils completely and more is necessary, but such cases are exceptional. The lymphoid nodules of the pharynx and adenoids also shrink under the raying. These small patients never complain of dryness of the throat although some of them have said they had pain in the throat during the evening following the radiation.

Some slight swelling of the parotid and submaxillary gland was occasionally noted which passed off in twenty-four hours. In other words with simple hyperplasias the mechanical results were, on the whole, good, while clinically many of the children appeared better, others seemed not to be affected by the reduction in size of the tonsils or about what is observed after tonsillectomy.

Some adults did very well. They did not have their usual winter bronchitis or sore throat, and were extremely enthusiastic; others, in somewhat smaller proportion, did not get any striking benefit. In the rheumatic cases about an equal number reported great improvement, and no improvement at all. In two cases in which mild rheumatism had been present, radiation increased the joint pain occasionally, though after a complete course of radiation had been carried out considerable improvement was noted and no return of rheumatic symptoms.

In conclusion, radiation treatment of hypertrophied tonsils seems to be a simple and harmless method for the reduction of the size of the uninfected tonsil. The final effect on the general health needs the study of a large series of carefully observed cases. In adults, especially the rheumatic ones, benefit may or may not be obtained. All patients should be carefully studied before the tonsils are rayed to see that the source of infection is not in the sinuses, teeth, or elsewhere and no final

conclusions can be drawn at the present time as to the value of the method.

DR. ISAAC LEVIN corroborated what Dr. Wood had said. In the first place, X-ray treatment of the tonsils is such an extremely simple matter for any radio-therapeutist that there is no need to ask Dr. Witherbee's approval to refer them to anyone doing this work. In the second place, it will require a long time to settle the question as to the actual value of this method of treatment. Dr. Levin said that he had been one of the first to take up this subject at the Montefiore Hospital and had there one series of cases treated by X-ray and another treated by radium, and is following up the patients, but was not yet prepared to form a final opinion. It will take several years before a correct estimation of the value of the method can be formed.

He therefore suggested that instead of appointing a committee to observe Dr. Witherbee's treatment of these cases some of the large throat institutions should select a series of cases and have them treated by X-rays and watch the patients for about three years, they would then be able to have a definite opinion on the subject.

DR. SEYMOUR OPPENHEIMER said that when this subject was first exploited he had the impression that Barnum was right and that, that impression had been strenghened by listening to the reports of the clinicians this evening. In his own practice, in spite of the prejudice which he had against the treatment at its inception and in spite of his belief that there are but the fewest cases where there is distinct contra-indication to surgical procedure, yet to satisfy himself as to its possibilities he had subjected two cases of adults to X-ray therapy. All of the cases were carefully cultured in advance of the treatment. Most of them did show some reduction in the size of the tonsillar mass as the result of the treatment. Practically all had had recurrences of acute tonsillar infection since the X-ray treatment. The cultural features which were present prior to the treatment have remained identically the same. Two of the patients had severe X-ray burns on the palatal structures which was very distressing; this is a feature which should be considered. Seven of the ten cases had systemic conditions associated with the local focus, such as arthritis etc., and in not a single instance was there any effect in correcting the general infection.

DR. BABCOCK, in closing the discussion, admitted the dangers of the X-ray and said he had seen patients rendered beardless following the X-ray exposures, but presumed it had not been properly administered. He fully agreed with the men who suggested that the subject should be more carefully isvestigated. It certainly seemed strange, however, that none of the good results are seen, but only the ineffectual ones. If the treatment had real virtue, it should be used; if not, it should not be foisted on the patients.

SECTION ON OTOLOGY.

May 4, 1923.

A Plea for an International Investigation into Otosclerosis and Allied Subjects. Dr. J. S. Fraser, Edinburgh, Scotland. (By Invitation.)

DR. DENCH expressed himself as being greatly pleased and educated by Dr. Fraser's masterly paper, it being the broadest treatment of the subject of otosclerosis he had ever heard. Usually the problem is attacked only from the angle of change in the labyrinth capsule and in consequence there is nothing to be done. Dr. Fraser had shown sections and dissections to show that it may arise in the labyrinth capsule inward but that it may also be associated with middle ear disease of both the suppurative and adhesive types. That is a very great advance.

The laboratory work is much in advance of what it was twenty-five years ago, when Dr. Dench was more familiar with it, but he could understand this work when demonstrated and Dr. Fraser had presented a most wonderful explanation of the most difficult subject the otologist has to deal with. The fact which he had pointed out that certain of these cases may extend from the middle ear to the labyrinthine capsule seems to offer a ray of hope to these patients.

In a discussion on otosclerosis with Dr. Neuman when he was a guest here in 1910, on pinning him down to the point of statistics, Dr. Neuman said that the cases of otosclerosis which we see constitute only a very small percentage of the total number. When it comes to a question of primary involvement of the labyrinth capsule, he had seen only 40. That was in 1910.

As clinicians, the otologist is all too ready—when a patient comes into the office with a marked impairment of hearing—to make a rather rapid and cursory examination and give an unfavorable verdict. The last thing he should think of is otosclerosis per se, but rather of one dependent on various conditions. As Dr. Fraser had said, the acute processes in the middle ear in children are very common, and also in adults, and no doubt many mistakes have been made in cases of this kind, simply, where probably if the otologist had considered the possibility of either an adhesive or a suppurative process as a contributory factor he might have given some relief to the patient.

Dr. Dench said he had seen cases with the flamingo tinge of the internal wall of the middle ear, and in some instances had given an unfavorable prognosis, but the patients had insisted on having treatment and they had improved, so that he felt encouraged to believe that Dr. Fraser's paper held out a great deal of hope for such cases.

He was also glad to hear what Dr. Fraser said about causation. Many factors are at work. One may have a very simple case, primarily dependent on inflammation of tre middle ear; or there may be an intestinal toxaemia, perhaps a tobacco toxaemia, etc., which may determine the progress of the case. If these factors can be eliminated by the treatment of the focal infection and relief of the poisoning,, and the use of tobacco restricted—it seems that much hope can be held out to these patients and the field of otology advanced. Then, when one encounters the Bezold triad, something may be done for the relief of the patients instead of telling them that there is no hope for them and advising them to take up lip reading. There is nothing so terrible as to have to tell a patient that there is no hope, especially a medical or professional man.

Dr. Dench said that personally he favors re-education, though not by mechanical methods. Most of these have proved unsatisfactory. Two or three things have done a lot of damage, and he had seen enough of this to make him feel a right to give an opinion on it. He had seen a number of cases made worse by the use of vibratory massage and by the use of loud sounds, also by the use of the Massicon, by which the hearing is supposed to be stimulated by loud noises; he had seen such cases grow rapidly worse, and others by the use of the Delstanche masseur. Over-inflation also does harm, though improperly selected cases a certain amount of inflation certainly renders the progress of the otosclerosis slower. He has studied a certain number of cases in which no treatment was employed and others with regular treatment and occasional inflation, etc., etc., and these patients were a great deal better off than those who consulted otologists and were given no hope. The one group is entirely deaf, and the others deaf, but have some little hearing. There is no class of cases which require more judgment or more careful study. These are the cases of otosclerosis which perhaps have a concomitant or predisposing condition in the ear.

Dr. Dench said he was glad to hear what Dr. Fraser said about pilo carpin, for he has seen some cases improved: not many, but some do get better, and he had seen cases improved by the use of pilocarpin in-

ternally. He had been surprised to hear Dr. Fraser say that vertigo was an uncommon symptom, for in his own experience it had been common, especially in cases with intra-tympanic lesions.

The latter part of the paper seemed to carry a suggestion which should be borne in mind by every one, that a line of investigation should be established, whereby the clinicians and pathologists should work hand in hand in studying this subject; for the man who undertakes to do both will probably make a failure of it. There is, however, a large opportunity in all of the large cities of the country for the young men who are not yet well established—and need a certain amount of fixed income to make both ends meet—to do a certain amount of research work. The Trilogical Society of this city and the American Otological Society would be glad to contribute to such a fund, and the Rockefeller Foundation and other institutions would undoubtedly put at the disposal of young men who would take up this work funds sufficient to provide them with a living while doing this valuable work. There is certainly a large field for it. It is a most valuable, practical, and thoroughly scientific proposition that has ever been made. By dividing the work so that clinicians and pathologists may work together, much can be accomplished.

One of the first things, however, is to obtain pathological material. Much valuable pathological material now goes to waste, and if this were made available there would be little difficulty in carrying on this important investigation. The profession certainly owes Dr. Fraser a debt of gratitude for presenting this subject through all the various stages and finally suggesting a solution of this most important problem.

Dr. Kerrison said it was an interesting fact that the pathologic specimens illustrating this exceedingly interesting paper represented the work of the two men who were the recognized British authorities on otosclerosis. If he understood correctly, both Dr. Gray and Dr. Fraser held otosclerosis to be a generative process, depending in a large percentage of cases upon a congenital defect, or structural abnormality, in the bony capsule. Both seem to believe that the congenital bone error or deficiency may be present in different individuals in varying degrees; so that there are some who will develop otosclerosis under any possible conditions however favorable; others who may or may not develop otosclerosis, and still a third class, who on account of complete congenital normality, cannot or will not develop otosclerosis under any conditions. Dr. Fraser's view of the disease is a more comforting one than that expressed by Dr. Gray in his writings, for the reason that while both recognize the congenital factor, Dr. Fraser seems inclined to give greater prominence than Dr. Gray to such exciting causes as otitis inflammations and infections. This hypothesis is important in establishing some basis for rational preventive treatment. That's to say, it is important if tenable.

Dr. Beaman Douglass said that though he was simply a rhinologist he sees enough of these cases in private practice to be very much interested in them and to have come to this meeting to hear Dr. Fraser's paper hoping for some stimulation in work along this line. One of the things said in this most excellent and useful paper was the reminder that in the ear alone is the only portion of the whole body where we have joints in connection with mucus membrane. That suggested the analogy between the ossicles of the ear and the turbinated tissues of the nose; and then when the lantern slides were demonstrated, showing the mucus membrane of the ear in a diseased condition, and the malleus and the incus in the same condition, and afterward the capsule of the labyrinth with the tissue affected, and the foot of the stapes in close connection with the mucosa adjacent to the stapes, it recalled Dr. Douglass's early studies on the turbinal bones under the microscope, where he had noticed in the bone lesions this same differential staining which Dr. Fraser spoke of in the labyrinthine capsule. In the definite disease one sees very diffuse and very unequal stains, and sometimes just what

Dr. Fraser had showed in the ear occurs in the turbinal bone tissues, which take the blue stain more clearly than the eosin stain.

This was very suggestive, for it emphasized the possibility that these cases, while they sometimes may be due to entirely different conditions, may be in the majority of the cases due to catarrhal lesions in the middle ear, and otologists should hold out some hope and treat these catarrhal conditions, and so may be able to prevent the development of these sclerotic changes which may be only a late development of an old catarrhal middle ear condition.

DR. L. M. HURD thought it ought to be possible for the medical profession to get together for the support of work along this line in a scientific laboratory, such as is done in commercial bread-making. Why should not all contribute to such work which needs to be done, and from which all would benefit? Neither Dr. Fraser nor any one else could do it alone. The dues for such an association would be very small and those who were interested would have the information come back to them. As Dr. Dench had said, the otologists would gladly back the Rockefeller Institute or some other which would undertake such research. If the nose and throat men and the otologists would only get together in some such way, there would soon be raised a fund to support such work and enjoy the benefits of it.

DR. HAYS said that all were delighted to hear Dr. Fraser's remarks chiefly because the interpretation of otosclerosis is rather obscure. Two years ago when Dr. Perry Goldsmith, of Toronto, read a paper on this subject before us, it was rather generally acknowledged that there was not much to be said about the subject, and no encouragement to offer the patient, so far as treatment was concerned. Two things had impressed him very strongly: One, that there is such a thing as otosclerosis which can be diagnosed; and second, that there was some hope of improvement for some of these cases. One fault with the majority of men is that they make a rapid examination and jump to the conclusion that the patient has otosclerosis, and as a rule they give a hopeless prognosis. Dr. Hays said further that out of the numerous cases seen in the clinics and in private practice only a very small number of those that have been diagnosed as otosclerosis have that condition. Some have other conditions than otosclerosis and a great many of these conditions can be improved, and sometimes permanently so. A number of the men in the city are vitally interested in the problem of the deaf, not only from the medical but also from the social and economic points of view, and we have associations of people who have given up all medical treatment, and a majority of these persons have been told that they have otosclerosis. Many of these, while they have given up medical treatment, are consulting Christian Scientists, chiropractors, etc. It is a very unfortunate state of affairs. Dr. Hays said he has found it very difficult to parallel the pathological features with the clinical findings and to determine definitely that a patient has otosclerosis. He agreed heartily with what Dr. Fraser had suggested, the organizing of some sort of association whereby clinical and pathological findings may be correlated, in the hope of finding that something more can be done for these cases.

DR. EMIL MAYER was particularly interested when Dr Fraser referred to the ozena investigation in this country for which investigations Dr. Mayer had charge and therefore felt that he could speak a little more authoritatively than others on the question of international investigations such as Dr. Fraser had proposed.

He did not however agree with Dr. Fraser that this investigation should originate in America.

In his opinion America should assist but the work should be under the direction of a man like Dr. Fraser who would direct the whole subject, assigning the studies to different men.

The investigation would have to be made partly by the laboratory and partly by statisticians.

Doubtless the part of the paper which Dr. Fraser did not read had reference to the plan and scope of the proposed investigation.

It had been said that the Rockefeller and Carnegie foundations might be of help. The speaker was not so sure of this, but felt confident that a powerful and wealthy society like the American Academy of Ophthalmology and Otolaryngology would surely render valuable assistance.

In the ozena investigation some very interesting problems were worked out, one of them the probable occurrence of ozena among the North American Indians as also among the negroes.

Some of the experiences of those who have undertaken general investigations in the past would be of value in working out these important plans of Dr. Fraser.

Dr. Mayer spoke of the investigations of toxicity in local anesthesia which he was still carrying on, and had been for the four years at the request of the Therapeutic Research Committee of the Council on Pharmay and Chemistry of the American Medical Association.

He soon ascertained that physicians pay no attention to announcements in their medical journals and the only way to elicit any response was by means of a questionnaire, this latter should contain as few questions as possible and in all probability answers would be received from forty to fifty per cent of these, provided the questionnaire is backed up by a reputable medical society.

In this connection Dr. Mayer expressed his surprise at the failure of medical men to reply to communications that were of such vital interest to themselves.

He was prepared to agree with Dr. Fraser as to the need of a thorough study of this subject of otosclerosis and would be glad to give such a committee the benefit of his experience.

Dr. Josephson asked a point of information with regard to the pathology of otosclerosis. He has been informed by Dr. Christeller of Berlin, that the latter has noted a marked resemblance between the lesions of otosclerosis in man and the lesions of osteo-fibromatosis, especially of the bones of the face, found by him in both man and lower animals. He was also of the opinion that osteo-fibromatosis of the facial bones was associated with true otosclerosis lesions in lower animals. Dr. Josephson requested of Dr. Fraser his opinion on this matter, and also asked whether lesions of osteo-fibromatosis involving the bones of the skull and face had ever been observed by him in his cases.

Dr. Fraser, replying to Dr. Josephson, said that spongification of the oscilles had been found microscopically in a cat by a German observer. The specimen was a beautiful one, showing not only ostitis vasculosa of the labyrinthine capsule but also of the malleus and incus. That was the question—whether or not otosclerosis was a single disease.

It is by no means certain that the condition is as uncommon as some seem to think. All have seen the flamingo tinge, etc. We can be suite certain of the diagnosis in such cases but two of Dr. Grey's cases had been shown, which had either otitis media purulenta or the results, and of the four cases of his own, which had been shown, all had either middle ear supuration or an adhesive process. That means that there are a large number of cases of otitis media in which otosclerosia is also present. Dr. Fraser himself has examined the temporal bone in nearly 200 cases and has found four with otosclerosis. He therefore feels that otosclerosis is a common disease. Dr. Grey thinks that probably one person in every 200 has otosclerosis. In examining foetal labyrinth capsules, it was found that they were "rests" of cartilage in something like 5 per cent of the cases. Certainly we know that 5 per cent of the population have not got otosclerosis, but it is quite likely that Grey is right in saying that one in every two hnudrd persons has the trouble.

Dr. Fraser quite agreed with Dr. Dench that the "otitis media" view of

the pathology is the more hopeful one, i. e., that treatment is more hopeful; if one thinks of otosclerosis as something that one is born with, the outlook is most discouraging.

He did not feel that he wished to encourage useless operations on the nose. He had however been much impressed with the case he had spoken of in which vaccine therapy had been employed. The results hitherto obtained in otosclerosis are so bad that one is only too glad to try any line of treatment so long as it is not likely to do harm. One should not rush into these operations on the labyrinth. He did not feel like trying any more of them. In order to test the results of any line of treatment, however, one would have to enlist the services of a certain number of men who would examine a given series of cases twice a year, for a length of time. The number should not be too large or the cases would not be examined thoroughly. Ten cases examined regularly and checked up by some one else would be quite enough. Professor Hugo Frey expects to read a paper shortly on the X-ray treatment of otosclerosis; he seems hopeful of the results. Other observers might take up endocrine gland therapy and see what can be gotten there.

All this work could not be undertaken by any one man, but by a team in every country and community. The ideal plan would be for all the ear, nose and throat societies in America to organize and combine to do this work and then suggest the co-operation of other countries. Certainly some method should be devised whereby the subject of otosclerosis should be studied more thoroughly and widely instead of only by isolated individuals here and there. In his opinion Germany and Austria should be invited to join in an international investigation. It might be well however to wait a year or two before going on with the matter.

Referring to Dr. Kerrison's remark that the speaker and Dr. Grey seemed to be rather far apart, Dr. Fraser said that Grey denies that the appearances which had been shown on the screen are of an inflammatory natures, whereas he himself believes that they are. The group of professors to whom he had submitted the question could not be induced to say anything one way of another. His first paper on otosclerosis had been written in conjunction with Dr. Richard Muir, an expert pathologist, who expressed the opinion that the changes were of an inflammatory nature.

Dr. Fraser said it was only too true that many persons suffering from otosclerosis went to quacks, but personally he could hardly blame them when they were told by legitimate otologists that nothing could be done for them. He could only feel sorry that they were spending money on various appliances, such as vibrators, which are advertised to relieve or cure deafness and tinnitis.

SECTION ON LARYNGOLOGY AND RHINOLOGY.

May 22, 1923.

Osteosarcoma of the Superior Maxilla. Dr. Harris.

Patient is a man of 40 who was operated upon by Dr. Robert Morris, eighteen years ago for a growth of the superior maxilla on the left side which upon examination proved to be osteosarcoma. Several minor operations of the nose and jaw have been performed in the mean time but there has never been any recurrence of the growth. Last March, he presented himself at the clinic, complaining of pain in the right side of his face. Examination was negative, so far as the nose is concerned. There was perforation of the hard palate on the left side. Transillumination showed right antrum densely cloudy. An attempt was made to puncture the antrum for exploratory purposes without success. The

X-ray pictures showed a mass involving all the accessory sinuses on the right side except the frontal. There was a negative luetic history but the examination of the blood gave a 4+ Wassermann. The patient was put on anti-luetic treatment and has had five injections of salcarsan and three of mercury. There has been no change in the condition externally but the perforation of the hard palate has decidedly increased. The patient is at present under the care of Dr. Forbes who has under consideration the radical removal of the growth followed by the application of radium.

DISCUSSION.

DR. THOMAS J. HARRIS said that there was a similar case of bilateral osteosarcoma reported in 1919. This patient also gave a ++++ Wassermann without being able to get a history of infection. This boy was sixteen years old and had anti-luetic treatment for some time, and the small mass on the outside of the cheek went down. Two years later the case was seen again, and there was no change in the sarcomatous condition. The fact of the ++++ blood Wassermann is mentioned because Dr. MacNeal seemed to think that a sarcomatous condition caused a tissue destruction which is evidenced in the blood reaction in a similar way to syphilitic infection. He said that in small pox and epithelioma a positive reaction is also obtained.

DR. HARRIS spoke about the perplexities in the diagnosis of such cases. Without the same diagnosis they have been following a somewhat similar case at the Post-Graduate Hospital during the past winter, where it was very puzzling to know just what the condition was. They were not fortunate enough to get a strongly positive Wassermann reaction. The result was a doubtful reaction, a low positive. There was very distinct edema of the left arytenoid with an ulceration of the left cord. For a long time the diagnosis lay between malignancy and tuberculosis. As in Dr. Smith's case, Dr. Forbes made a direct examination and the case was followed with a good deal of care. The final diagnosis was one of malignancy. The great importance of blood examination in these cases should be emphasized. Even with the blood examinations there are cases where it is almost impossible for a time to decide definitely what one is dealing with in a person of more advanced years than the case reported, and there is the possibility that the case is not lues, but something else besides.

DR. FRANCIS W. WHITE: I was accorded the privilege of examining the patient in question.

The first thing to impress me was the complacency of the patient. It was evident the condition could not be very acute despite the history of only short duration. Upon examination of the larynx by means of the laryngeal mirror the mass as described by Dr. Smith, was clearly visible and was startingly out of proportion to the general attitude of the patient. Palpation of the mass resembled the sensation elicited by pressing on a piece of art-gum eraser. Manifestly until all laboratory methods of diagnosis had been exhausted, no clinical diagnosis could or could not be disproved.

This type of case goes to show once more how tolerant the larynx is to insult or even trauma; how indefinite statements are regarding localization of sensations, or onset of disease conditions in or about the larynx. When salvarsan first came out I tried it on a series of specific nose and throat conditions, the results being reported at that time before this Section. It was my experience that laryngeal conditions were the least favorably affected, therefore I congratulate Dr. Smith upon the masterly handling of this perplexing condition.

DR. SMITH in closing the discussion, said that he would like to emphasize still further the danger of operative interference in any larynx which is suspected to be syphilitic. No man is justified in puncturing such a larynx for edema. Any operative interferences should be done with the patient in the hospital so that it can be taken proper care of if

necessary. That is where good judgment was executed in not allowing anything to be done to this patient in the Outdoor Department of Cornell. Dr. Smith recalled a case which he had seen some years ago of a man who had an extrusion of the arytenoid cartilage. Under anti-syphilitic treatment the man apparently got well. He was sent to his home in New Haven, but in six months he came back with a well-defined carcinoma of the larynx. He died at the Manhattan Eye and Ear Hospital. Death was ultimately due to absorption, so that superimposed upon, or underlying a case of syphilis, there may be malignancy.

Fibro-Sarcoma of the Naso-Pharynx Treated by Operation and Radium.
Dr. Duncan MacPherson.

DR. DUNCAN MACPHERSON said that he was not showing this case because of anything especially unique about it. It is interesting because of the interest that is being shown in the relationship between operative work and the use of radium. It is with that in view that he decided to show it tonight.

About a year ago last April this patient presented himself at the Post-Graduate Clinic with swelling over the antrum and complete blocking of the right side of the nose by a naso-pharyngeal tumor. It was decided to take out the growth. The diagnosis of fibro-sarcoma was made, and it was decided to remove the growth through the antrum, making an opening anteriorly. The growth was in the antrum, but not attached to it, except by small fibrous trabeculae which were very easily broken down by the finger. The site of origin for the tumor was the attachment usually found for a fibroma, the latteral wall of the pharynx and the sphenoid base. The operation of course was very bloody, and Dr. MacPherson stated that if he were doing an operation of this kind again he would tie the carotid before attacking it. He had removed a few naso-pharyngeal fibromas and sarcomas before, and while all these cases bled a geat deal, he had had no dangerous hemorrhage previous to this one but in this case a rapidly performed intravenous saline had to be done to save the patient's life, to such an extent that a transfusion had to be done on the table. The growth was as completely removed as possible, taking it off with the forceps and scissors, but the base of the tumor which was left could not be remoced by any means. Since then radium has been used at intervals, and it has been successful in keeping the tumor in subjection. Tonight Dr. MacPherson found there was a recurrence in the nasopharynx. The growth bleeds very easily. He feels, however, that radium has done a great deal of good. If it had not been for radium or X-ray a secondary operation would have been necessary at a time when the patient was in no condition to be operated on, so that radium in this particular case saved the patient's life. Dr. MacPherson hopes by the use of radium needles and radium externally that possibly the growth will be entirely gotten under control. Dr. Robinson has been using the radium, and will tell about the dosage and when it was given.

DISCUSSION.

DR. G. ALLEN ROBINSON: Within a week after the operation the dose of radium was applied externally in the form of a block for 24 hours on the right side of the face over the growth. Because of the tumor and the hemorrhage at the time of operation this man's red blood count had gone down to 2,000,000 per C.M.M. About this time we were beginning the use of the drug, germanium dioxide, and we had a series of counts made on this patient. During two or three months his blood was brought up very rapidly by the use of germanium dioxide, which stimulates the red blood cells. His blood picture was practically normal when we stopped treatment. He has had about 10,000 milligram hours, which for the most part has been external treatment, but he has also had four treatments with needles internally. The further treatment will

be to place a tube or needles into the growth which has apparently recurred in posterior part of floor of the nose.

DR. COFFIN said that Dr. MacPherson's case reminded him of an unpleasant experience he had within the last few weeks. His case presented the same intra-nasal features as described by Dr. MacPherson: there was however, a decided asymetry of the face. The patient was a colored boy of sixteen years who came to the hospital with a letter from a physician of a neighboring town stating that after the removal of polyps there had been quite excessive hemorrhage, that the blood-clotting period was twelve minutes; this blood-clotting time was confirmed by our laboratory findings. Dr. Robinson applied radium by both block and needles. Fearing hemorrhage from insertion of needles patient was given fibogen intra-muscularly on hour and a half before the introduction of needles. There was no bleeding from the introduction of the needles into the growth either intra-nasally or through the naso-pharynx. Five weeks after the introduction of radium needles the boy returned to the hospital, said he could breath through the diseased side of the nose. On examination dimunition in size could not be made out. Operation was decided upon. There having been no hemorrhage upon puncturing growth with radium needles after the use of fibrinogen Dr. Coffin decided not to tie the carotid until such time as seemed necessary, the man having been given an intra-muscular dose of fibrogen one hour and a half previous to time of operation.

The growth seemed attached in its entire naso-pharyngeal circumference, finally the posterior lobe was found attached to the vertebra. whereas the growth was quite completely removed the boy had bled quite freely and seemed to be in a state of considerable shock. Transfusion was done on the table with a considerable favorable result so that Dr. Coffin and all who had assisted at the operation felt that the boy would come through all right.

An hour to an hour and a half after the patient had been removed to the ward he was called by the house surgeon who said that the boy was not doing well. Upon arriving at the bed-side Dr. Coffin found that the patient had ceased breathing. Autopsy was refused.

Dr. Coffin expressed regret that he had not tied the carotid as a preliminary to the operation and expressed the belief that it should always be done in these extensive operations about the head.

DR. SMITH stated that he did not feel the same enthusiasm about Dr. MacPherson's case that Dr. MacPherson did, as he had noticed exophthalmos of the right eye. He has never seen a case yet that occurred in the antrum or projected out into the nose in which the patient did not die. Unless radium does control it. Dr. Smith believes there is no method that can reach it. He has tried the method of cautenzation as advocated by Prince Brown of Toronto but the patients have all ultimately succumbed.

If the case is osteo-sarcoma of the jaw one can get around it by exenteration. If it is a fibro-sarcoma or a lympho-sarcoma it is beyond surgical reach.

DR. HARRIS said he was inclined to agree with Dr. Smith in his opinion of the outcome of operative procedure in fibro-sarcoma of the naso-pharynx. He had been caring for a case during the last winter in a man 38 years where the man's condition was so very much reduced that operation was considered unwise. This patient was treated by Dr. Willis and Dr. Robinson, very thoroughly with radium, and everyone was encouraged, but Dr. Harris thought perhaps the opinion was a false one, for the improvement was very fugitive, and the growth proceeded very rapidly downward. There was a very decided eating-out of the vertebra, and a trachectomy had to be done in order to allow the man to breathe. He died of gradual loss of strength. Dr. Harris said that he was thoroughly satisfied in this case that if the man had been strong enough for operation, the outcome would have been the same. His feeling was that some of the best cases are being turned over for radium, and here

was a most favorable case for its use, and the radium was employed by specialists over a considerable length of time, and yet the treatment failed. He was greatly disappointed at the outcome of the case, and whatever may be said of the value of the method, he agrees with Dr. Smith thoroughly about the non-desirability of surgical procedure.

DR. CARTER emphasized the advisability of tying the external carotid before operation. He has operated upon several of these cases, and has always tied the carotid; there has been little bleeding when this is done. He had a case of sarcoma of the antrum yesterday and intended to remove the superior maxilla, but after he had tied the carotid and had made a more thorough exploration of the conditions under anesthesia he decided that the disease had progressed so far that it would be useless to take out the superior maxilla. He took out the mass which filled the antrum and involved the ethmoid cells. The case was then referred for radium treatment. In doing all of this work there was almost no loss of blood. Tieing the carotid greatly facilitates the operative work in this area.

DR. E. E. HIMNAN (Albany) said that it was a privilege for him to say a few words before the Academy, although as a guest he did not feel entitled to do so. His experience has been somewhat limited with fibro-sarcomatous invasion of this part of the antrum, for one does not see so many cases of this sort in small clinics as one does in New York. However malignancy at that point is occasionally encountered, and within the last two or three weeks two or three cases of the same nature in just that area have been seen. However, not being sarcoma, it is hoped that a little better results will be obtained, because if there is one class of malignancy in this region that reacts better to the use of radium than any other, it is certainly those under the general classification of basal celled carcinoma, the so-called epidermoid carcinoma. In the last three weeks three cases involving the nose, the nasal chamber and a portion of the naso-pharynx have been seen. Two of them probably originated in the tonsillar tissue. Both of the growths were first thoroughly excised and then radiated. The third case, which is now under treatment, presented the same type of malignancy in the posterior nares of the right and left side, and it was so far back and so small in size that it was almost undiscoverable except for bleeding, especially on manipulation. Having gotten enough tissue to get a laboratory report of malignancy, needles were inserted in to the tissue. It is too early to say what the results will be, but all bleeding has stopped. The patient is more comfortable. With these cases if we are going to get results with radium the cases must be selected. Having selected a favorable type of malignancy, surgical procedure combined with radium application ought to give good results.

DR. COFFIN said that he had a case of sarcoma involving the antrum and fulging into the mouth, at the Manhattan Hospital several years ago in which he took out through the usual antral incision practically the whole of the upper jaw except the floor of the orbit. The patient had had radium post-operatively applied externally by Dr. Field. The man after leaving the hospital went to his family in Boston and was treated there by Dr. Green who inserted radium seeds in tissues about the operated field. Two years later the man was working and apparently all right. Dr. Coffin had not heard from him for about two years, but thought he would have heard had the man died.

DR. MACPHERSON, in closing, stated that when he said he believed the boy's life was saved, he did not mean that he was going to live to be three score and ten, but that his life was prolonged. He also said that he hoped that he would be able to cure him. In this case he does not feel that the radium has been used to the maximum amount, and he believes that the patient will stand larger doses than he has been getting, so that although there is a recurrence, by applying more radium the result may be better. For that reason there is some hope of the patient's cure. As Dr. Smith says, when the tumor invades the orbit, the outlook is very bad.

An Interesting Case of Traumatic Frontal Sinusitis, Operation and Recovery. Dr. W. W. Carter.

Dr. W. W. Carter showed a man 32 years old who had been knocked down by a motor truck and dragged a number of feet. The right clavicle was fractured, and there was a bad contusion on the right side of the orbit and over the nose which was fractured. He was admitted to Gouverneur Hospital on Jan. 7th, 1923, where his injuries were attended to by a general surgeon. A day or two after he had been admitted he complained of a good deal of pain in the head. A few days later the pain became localized over the left frontal sinus. It should be emphasized here that the external injury was more nearly over the right frontal sinus. The pain increased, and on the fifteenth day after the injury, that is Jan. 22nd, the case was referred to Dr. Carter. At this time there was considerable swelling over the left eye so that it could hardly be opened. The X-ray picture showed a frontal sinusitis. Dr. Carter demonstrated the plates which showed opacity of the left frontal sinus and a distinct bulging of the abscess through the septum into the right frontal, the outer portion of which appeared to be normal. Dr. Carter said what had evidently happened was that the left naso-frontal duct had been destroyed at the point where the nose was fractured and hemorrhage had occurred which had filled the left frontal sinus with an infected blood clot, resulting in abscess.

Operation: An incision was made from the inner edge of the left eyebrow nearly to its outer edge, and the soft tissues elevated. Then an incision was made at a little higher level through the pericranium; as soon as this was done there was a discharge of foul pus under moderate pressure, and an opening in the anterior wall of the sinus, the size of a dime, was revealed. This opening was enlarged, a considerable portion of the anterior wall above the supra-orbital ridge being removed. The sinus was filled with what at first sight appeared to be polypi, but on closer examination was found to be a disintegrating blood clot having no intimate connection with the lining membrane of the sinus. When this clot was removed it was found that there was an opening in the septum between the two sinuses about the size of a dime and that the lining membrane of the sinus was ballooned out into the unaffected sinus, but had not yet ruptured. Dr. Carter found the naso-frontal duct on the left side closed by a bony obstruction and opened it with a rasp. He then made an incision through the right eyebrow and removed a small button of bone from the anterior wall of the right sinus. This sinus appeared to be normal, save for the bulging into it of the lining membrane. This bulging process was opened so as to affect drainage through the right naso-frontal duct which was patulous and normal in every way.

At present there is no discharge and the patient feels perfectly well and there is no obvious scar or deformity. The previous history showed that he had not been subject to colds, and there was no suspicion of any frontal sinusitis before the injury. It is clearly a case of traumatic sinusitis.

(To be Continued)